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Picture Viewing as a Test of Attention to Food and Body Image Cues in Restrained Versus Nonrestrained Eaters

Sally Rose Brinza

PICTURE VIEWING AS A TEST OF ATTENTION TO FOOD AND BODY IMAGE CUES IN RESTRAINED VERSUS NONRESTRAINED EATERS

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Sally Rose Brinza

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This Dissertation submitted by Sally R. Brinza in partial fulfillment of the requirements for the Degree of Doctor of Philosophy from the University of North Dakota has been read by the Faculty Advisory Committee under whom the work has been done, and is hereby approved.

James R. Antes
Dr. James Antes, Chairperson

Lila C. Tabor
Dr. Lila Tabor

Dr. John Tyler

Alan K.
Dr. Alan King

Kathy Gershman
Dr. Kathy Gershman

This Dissertation meets the standards for appearance and conforms to the style and format requirements of the Graduate School of the University of North Dakota, and is hereby approved.

Harvey P. Knull
Dean of the Graduate School

12-13-90

Permission

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ABSTRACT

Restrained eaters, those who chronically and severely restrict food intake in order to lose weight, are thought to exhibit thoughts and behaviors similar to those seen in semi-starved and eating disordered (bulimic and anorexic) individuals. A paradoxical tendency to overeat once food restraint is disinhibited has been noted in restrainers. Food and body weight preoccupation and hyperresponsiveness to external food cues have been hypothesized to occur in restrained individuals; however the literature reports conflicting results and these factors have not been thoroughly investigated. Cognitive factors which differentiate restrained eaters from nonrestrained eaters may affect information processing.

The purpose of this study was to assess whether evidence exists for attentional differences between fasting and sated normals and restrainers when viewing food and body image stimuli. Normal weight, female college undergraduates identified as restrainers or nonrestrainers by the Revised Restraint Scale (Herman et al., 1978) fasted for approximately five hours. Half of the restrainer and nonrestrainer subjects were then given a milkshake to eliminate physiological hunger and the other subjects remained fasting. All subjects completed a short questionnaire detailing their current physical state and the A-State scale (Speilberger et al., 1970), a measure of current anxiety levels. The eye movements of these subjects were recorded as they viewed a series of slides, some of which contained scenes with food or women of various body shapes. Dependent variables

which assessed attentional preference and stimulus saliency were the percent, number and duration of fixations, total fixation time, and duration and number of fixations prior to focusing on critical items. Informativeness ratings of items in the six food and body image slides were obtained from a separate group of female undergraduates and used in the analyses.

The analyses did not support the predictions that fasting and restrainer subjects would show a preference in their attention toward food items nor that body image stimuli would be more salient to restrainers than nonrestrainers. Results indicated a significant preference for all experimental groups toward viewing body image stimuli versus food stimuli. Results further suggested a trend toward fasting nonrestrainer subjects' attention being drawn to food items more than other subject groups. Surprisingly, the restrainer group acknowledged a significantly higher level of anxiety than the nonrestrainer group.

Nonsignificant results regarding the relative saliency of food and body image stimuli to fasting subjects and restrainers were hypothesized to have occurred due to possible experimental and subject confounds. Additionally, perceptual defense and supression processes were suggested as explanations for restrainers' disavowal of hunger and possible avoidance of food cues.

CHAPTER I: INTRODUCTION

The present study explored the effect of a restrained eating pattern on attention to visual presentations of food cues and body images. Restrained eating is a weight loss strategy. Consumption of calories is kept to a minimum in order to achieve and maintain a slim physique. Research on restrained eating has come to the forefront due to its connection with certain clinical syndromes such as anorexia nervosa and bulimia nervosa. Both disorders involve severe restriction of food intake.

Interest in dietary restraint has its roots in earlier research which examined why obese individuals differed from normal weight individuals in their eating patterns. The two major theories which developed to account for obesity-normal weight differences were Schachter's internal-external theory of obesity (1968, 1971) and Nisbett's set-point theory (1972).

Schachter found that obese subjects were overly responsive to external stimuli such as time of day and availability of food, and less responsive to internal stimuli such as gastric secretions and blood sugar levels, compared to normal weight subjects. Obesity, under this model, was thought to result from eating behavior being controlled excessively by external cues rather than internal cues of hunger and satiety.

Nisbett challenged Schachter's theory that "externality" was the defining characteristic of obese individuals. He argued instead that obese individuals were often dieting to meet cultural standards of attractiveness despite being at their appropriate weight according to

biologically determined factors. Therefore, they were hypothesized to be continually in a state of semi-starvation due to weight reduction attempts. Cognitive and behavioral similarities between dieting obese subjects and semi-starved normal weight volunteers lent support for Nisbett's theory. Similarities between these two groups included a preoccupation with food, hoarding food, binge-eating, and excessive concern with weight and body size (Keys, Brozek, Henschel, Mickelson, & Taylor, 1950; Nisbett & Kanouse, 1969).

During laboratory investigations of restrained and nonrestrained eaters, Herman & Mack (1975) gave restrainers (restrained eaters) and nonrestrained eaters (normal dietary intake) a milkshake "preload" before being given the option of additional food intake during a contrived taste test. They discovered that restrainers who were given the "preload" ate substantially more during the taste test which followed than restrainers who were not given a preload and more than nonrestrainers who were given a preload. It was proposed that restrained eaters experienced disinhibition of efforts towards dietary restraint due to having eaten what they perceived to be "fattening" food. This perceived failure to avoid high caloric consumption resulted in counter regulation (Herman & Polivy, 1975). Counterregulation is the paradoxical process of dieters eating more food after experiencing disinhibition of their dietary restraint, rather than less food, as would be expected in normal regulation of satiety. Food deprivation, combined with rigid, all-or none,

cognitions such as "I've blown my diet, I may as well eat all I want", are believed to lead to counterregulation.

This counterregulatory effect seen in the laboratory with normal-weight restrained eaters was first proposed to account for obese/normal weight variations of food regulatory behaviors. Although obese subjects have been found to exhibit behaviors similar to restrained eaters, no studies have reported that overweight individuals counterregulate (Ruderman, 1986). Recent theorizing, however, hypothesizes that restraint behaviors function in a manner similar to binge-eating tendencies in patients with eating disorders (Herman & Polivy, 1984: Wardle & Beinart, 1981). Binge eating has been defined as rapid consumption of an extremely large amount of food in a relatively short period of time. Binge eating is a significant component in bulimia nervosa and is also found in a subpopulation of individuals with anorexia nervosa.

The Boundary Model (Herman & Polivy, 1984) was proposed as a means of explaining differences in the level of restraint between normal and obese subjects. This model was then expanded to incorporate different levels of restraint exhibited by anorexic and bulimic individuals as well. Central to this model is the assumption that biological pressures associated with hunger and satiety work to maintain consumption within a certain range. Hunger and satiety are at two opposing ends of the continuum of hunger level. However, when not experiencing physical hunger oR fullness, there is a range in which psychological, rather than physiological, factors have their

greatest influence on the regulation of food intake. Restrained and Binge eaters are hypothesized to have a lower threshold (i.e., boundary) for perception of hunger and a higher threshold for the perception of fullness in comparison to nondieters. Restrainers also set a limit on the amount of food which is acceptable to consume. When the limit is exceeded, Restrainers will continue to eat until full, rather than eating less as a means of regulating minor lapses in restraint, similar to nondieters. The Boundary Model explains how physiological and psychological factors can work to cause restraint, disinhibition of restraint and counterregulation among various groups but it does not explain why individuals develop these eating patterns.

As of yet, the exact role and nature of restrained eating in the development and maintenance of these disordered eating patterns is uncertain and has led to a great deal of theorizing and research. Since cognitive factors are hypothesized as central to the construct of restraint, the present study was an attempt to link theories of restrained and disordered eating patterns with the human information processing area of cognitive psychology. Under the human information processing model, the acquisition, memory, and use of information may vary as a function of individuals' experiences with their world. According to Eysenck (1982), individuals may be prone to attend differentially to stimuli in their environment. He contended that the basis for individual differences in attention or arousal towards

particular stimuli rests in what their primary motivation is at that moment.

Food preoccupation and excessive concern with achieving a thin body size found in diet restrictors and people with eating disorders may represent cognitive sets which heighten the salience of food and body image cues, and, thus, produce a higher external responsiveness (Kotschwar, 1986). Food and dieting preoccupation may also bring about an attentional bias for food and body image stimuli. Eye movements have been used as a valid means of indicating attention and attention shifts. Therefore, eye movement studies can provide a means for predicting eye movement patterns of restrained eaters on the basis of what they are likely to find as "informative".

The remainder of this chapter will explore more fully the ideas presented above in an attempt to explain the basis for examining cognitive constructs identified in restrained eaters using eye movement apparatus to detect attention and attentional shifts.

Theories of Obesity/Normal Weight Differences

Schachter and his colleagues were the first to demonstrate that eating behavior of obese subjects may be greatly influenced by external circumstances. These studies suggested that external cues may differentially affect eating behavior. Nisbett presented an alternative explanation to findings of hyperresponsiveness to external stimuli occurring in the obese. He asserted that each person has a unique, biologically determined set-point which puts pressure on individuals to maintain their weight within this

biologically, rather than culturally, ideal range. Obese people generally are obese merely because they have a higher than average set-point for their body weight. Because they are constantly dieting to maintain a more culturally acceptable weight, they are chronically hungry. Hence, the obese are more susceptible to external food cues. Herman, Polivy and associates have attempted to show, however, that chronic dietary restraint, not obesity, is responsible for increased cognitive responsiveness to external cues.

External-Internal Theory of Obesity

Fundamental to the development of theory regarding dietary restraint was an internal/external dichotomy proposed by Schachter (1971). He hypothesized that the obese were more responsive to external stimuli than nonobese individuals who were more responsive to internal stimuli. Schachter defined external stimuli as a characteristic of food or of the environment which must be cognitively or perceptually processed, such as taste or sight of food, or passage of time. Internal stimuli were regarded as physiological processes, such as gastric constrictions and distensions or blood sugar levels.

Schachter's studies in the 1960's and 1970's, and those following his lead (e.g. Rodin, 1973), used a taste-test paradigm to examine situation-controlling variables in food consumption such as time of day, the sight of others eating, and the availability, fragrance, and palatability of food (Nisbett, 1968; Schachter & Gross, 1968). The majority of studies undertaken resulted in

compelling support of the hypothesis that the obese overeat as a result of excessive external responsiveness to food and a lack of attention to internal cues.

Further investigations initiated by Schachter's theory hypothesized that obese and anorexic subjects would be less aware of and responsive to physiological indications of hunger. Garner, Garfinkel and Moldofsky (1978) reported on studies which used an intragastric balloon to measure gastric contractions on obese (Stunkard and Koch, 1964) and anorexic (Silverstone & Russell, 1967) subjects in comparison to normal weight subjects. Both the obese and anorexic groups were characterized by a lessened ability to report hunger in association with gastric motility in contrast to normal subjects. Anorexic subjects were able to recognize stomach contractions but were not as likely to report these as a sign of hunger. In addition, both obese and anorexic subjects have been shown to be less accurate than normals in their perceptions of the amount of food directly introduced into their stomachs (Coddington & Bruch 1970, reported in Garner, Garfinkel & Moldofsky, 1978). Bruch (1973) has claimed that obesity and anorexia nervosa are related to one another due to both lacking accurate hunger and satiety awareness as well as other bodily sensations. However, there have been challenges to the theory that obese people are insensitive to internal stimuli (O. Wooley, 1971 & S. Wooley, 1972).

Schachter's work was extended by himself and others to incorporate the belief that obese subjects were more highly aroused

or distractible than nonobese individuals in many nonfood areas of functioning. Rodin (1973), White (1973) and Rodin, Elman, & Schachter (1974) contributed data to the question of the role of environmental factors in eating. They found obese groups ate significantly more (White, 1973) and reported higher arousal (Rodin et al., 1974) when subjected to emotionally disturbing audio or visual material.

Pliner, Meyer and Blankstein (1974) tested the hypothesis that the obese are more responsive than normals to both positive and negative affective stimuli. Using a laboratory setting they exposed male high school and college aged subjects to a positive, negative, and emotionally neutral slide imbedded within a series of irrelevant slides. Subjects were instructed to rate the slides on a 7-point Likert scale with various pairs of affective adjectives (e.g., tensing-relaxing). Results confirmed that obese subjects rated the positive slide more positively and the negative slide more negatively than nonobese subjects.

Polivy, Herman, and Warsh (1978) attempted to replicate the Pliner et al. study to test whether dieting was a factor which led to the stronger emotional response observed by Pliner et al. in obese subjects. Dieters were found to be more responsive to slides than nondieters but when given caffeine, nondieters became more emotional and dieters became less emotional. These findings were not readily explainable. Further research in this direction has uncovered additional anomalies which have shed some doubt on the ability of

externality theory to account for differences observed between the obese, restrainers and normal weight-nonrestrainers.

Recent research has begun to explore the limits of the original external hypothesis in accounting for obese/nonobese differences. Rodin (1981) and Edelman (1984) have indicated that there are individuals of all weights who are externally responsive and those who are not. Although externality theory may not be a sufficient explanation for obesity (Edelman 1984; Rodin, 1981; Ruderman, 1986), differential sensitivity to internal and external cues may be an important factor in the control of body weight. However, problems in specifying external responsiveness have made it difficult to compare various studies examining externality.

Set-point Theory of Obesity

An alternative hypothesis to explain initial data on obese subjects' external orientation has been suggested by Nisbett (1972). Nisbett's early studies supported the view that the obese are governed by external cues related to food. He found that regardless of their state of deprivation, obese individuals ate more when food tasted very good (Nisbett, 1968), was more available (Nisbett, 1968), and when its appearance was attractive (Nisbett & Kanouse, 1969). Thus, "external" factors such as taste, appearance and amount related to eating behaviors for his obese subjects. However, Nisbett hypothesized that the apparent connection between external responsiveness and obesity is mediated by chronic, physiological hunger. The obese, according to Nisbett's set-point theory, are

overendowed with fat cells and consequently overeat in an attempt to satisfy the demands imposed by their adipose tissue for repletion. Since they are at a higher set-point than is socially desirable, they diet to lose weight. Therefore, dieting obese subjects are chronically hungry because they keep their weight below a natural set-point. In this view, such demands are expressed indirectly through an external orientation to food cues which characterizes food-deprived organisms. Comparisons between semistarved normal volunteers and eating disordered subjects support this view (Johnson, Connors & Tobin, 1987; Kaplan & Woodside, 1987; Keys et al., 1950).

However, some evidence contradictory to Nisbett's claim that externality is caused by food deprivation has been found among subjects who lost weight from a severe caloric restriction diet (Rodin et al., 1977). Their results indicated that subjects' degree of responsiveness to external cognitive cues such as the sight or thought of food did not reliably change (increase) during or after the weight loss.

Restraint Theory

Externality and set-point theories increasingly failed to account for differences observed between obese/nonobese subjects in their response to food cues. In addition, parallels between the behavior of obese and hungry individuals were noted (Nisbett, 1972, cited in Klajner et al., 1981). Studies began to indicate that it was likely the prevalence of dieting among the obese rather than any characteristic trait that accounted for the findings between obese

and normal weight subjects (e.g., Klajner, Herman, Polivy & Chabra, 1981). Thus, Herman and Mack (1975) attempted to extend Schachter's externality theory of obesity to normal-weight dieters using the concept of dietary restraint (Polivy, Herman, Olmstead & Jazwinski, 1984). Herman and Mack (1975), and later, Herman and Polivy (1980), believed that normal weight dieters were also unresponsive to internal cues of satiety. Because the dieter must oppose such driving physiological forces associated with hunger, the dieter must engage in willful psychological control over the physiological and sensory elements. Therefore, their theory introduced a prominent role for cognitive, or psychological, explanations for obese versus nonobese differences. Because the obese were often dieting, Herman and Polivy asserted that it was conscious restraint which is the correlate of externality, rather than obesity or deprivation (Rodin, 1981). Rodin (1981), however, maintained that it is externality which leads to restraint.

Measurement of restraint. Dietary restraint has been measured extensively in subclinical populations with paper and pencil self-report measures, such as the 10-item Restraint Scale developed by Herman, Polivy, Pliner, Threlkeld & Munic (1978). The Restraint Scale is a self-report scale used to identify dieters in the general, nonclinical, population. This scale has been found to differentiate effectively groups of dieters from nondieters. High and low scoring subjects differ from each other in eating style, emotionality, and physiological characteristics (Polivy, Herman, Olmstead & Jazwinski,

1984). Test-retest reliability over a 1-week period for the original scale was .93 (Herman et al., 1978). Kickham and Gayton (1977) found the same test-retest reliability (.93) in their subjects over a 4-week period. In addition, they found the Restraint Scale correlated only .11 with a measure of social desirability, indicating that it is not contaminated by this type of response set.

Those with a score of 13 or less on the Revised-Restraint Scale (RRS) can be classified as non-dieters, and those with a score of 18 or more as chronic dieters (Brinza, 1987; Klajner et al., 1981). The restraint scale has been found to be significantly, although moderately, related to degree of overweight (.38-.40) and bulimia (.42-.45) (Ruderman, 1985). Brinza (1987), using the Revised Restraint Scale (RRS), the Bulimia Test, and the Anorexia Bulimia Inventory (Stein, 1987) collected information from 488 females ages 11-18. The RRS was found to have a correlation of .64 with the Bulimia Test. Furthermore, all of the students identified as likely to have an eating disorder due to high scores on the inventories (n=19) were currently dieting. However, only 30% (n=95) of the controls were currently dieting.

The scale has been useful in discriminating normal weight college students in terms of the amount of concern they show towards weight and the level of resistance to food they are likely to demonstrate. However, the scale cannot account for the weight differences between groups of overweight versus underweight chronic dieters (Counts & Adams, 1985; Ruderman, 1985).

Recently, Stunkard (1985) has attempted to assess dietary restraint irrespective of weight differences. He has developed a Three Factor Eating Questionnaire which measures the factors of cognitive restraint, disinhibition and hunger. Because it is relatively new and not, as yet, widely used, it is uncertain how valid the scale is.

Research paradigm for restraint. Although Schachter and his colleagues originally developed the "taste test" design to study obese/nonobese differences (see Schachter, 1971) Herman and Mack extended the use of this design to restrained/nonrestrained subjects. The paradigm involves a contrived "taste test". Subjects are instructed to rate, in a private setting, a sample of food (usually ice-cream) according to quality of taste. After rating the food, subjects are then informed that they are free to eat as much as they want of whatever food is made available. The amount of food consumed during the free access portion is measured and compared across groups e.g., high vs. low restraint.

Recent Extensions of Restraint Theory

Experimental studies of normal weight restrained eaters demonstrated repeatedly the association between dieting and the paradoxical tendency to overeat (e.g. see Ruderman, 1986). This led to further development of restraint theory. Two major contributions to restraint theorizing have been the proposal of a "disinhibition hypothesis" and recently, Herman and Polivy (1984) have proposed a

"boundary model" to explain differences in the level of restraint between normal and obese groups.

Disinhibition and counterregulation. According to the disinhibition hypothesis, the paradoxical overeating observed in laboratory studies of restrained eaters is brought on by "disinhibitors" which lower ones' self-control temporarily. When disinhibition occurs, the physiological need for food wins out and large quantities of food are eaten. Cognitive, emotional, and pharmacological factors promoting disinhibition have been identified. Cognitive disinhibitors include such all-or-none thinking as "I've eaten something I shouldn't have, I may as well eat all I want now". Because of their importance to this study, cognitive disinhibitors will be discussed more fully later. Emotional disinhibitors may be any strong, negative emotional state, such as anxiety or depression, which decreases ones' motivation to stick with a diet. Pharmacological agents such as alcohol and other sedating or relaxing substances can interfere with one's ability to maintain will power and energy to diet. Most of these disinhibitors have only recently been studied and further replications are needed to confirm a reliable effect of disinhibitors.

Boundary model of restraint. More recent theorizing by Herman and Polivy (1984) has led to a Boundary Model of restraint to account for regulation of eating by restrainers, binge eaters and anorexics. All people are identified as being under the control of biological forces. We experience aversive feelings of hunger or "fullness" when

we have either gone too long without food or eaten too much food at one time, respectively. However, there exists much room for varying perceptions and motivations to eat or not eat between the two points of hunger and satiety.

Viewing hunger as multicausal may help explain the lack of a strong relationship between particular physiological correlates and the connection to initiation of food intake. Hunger has been assumed to result from such factors as changes in blood sugar level, a lowered supply of fuel to the tissues, or changes in neural activities in the hypothalamic area of the brain (Bruch, 1973; Hebb, 1949). When hunger is used as an experimental variable, typically relying on self-report to determine its level, it becomes apparent that there are a number of experiences, including physiological and psychological components, which have the potential to be labelled as hunger. Variables such as bodily cues, time of day, and the sight of food may or may not influence hunger perception. If this view were organized within the Boundary Model of restraint then nonphysiological hunger cues would be most potent in the zone of "biological indifference". This indifferent state lies between the boundaries of hunger and satiety where physiological pressures are exerted to prompt the individual to initiate or terminate food intake.

It is within this range of biological indifference that psychological factors are believed to have their greatest influence and differentially affect eating behaviors in different groups.

Restrained eaters are hypothesized to have lower hunger boundaries and higher satiety boundaries than nondieters (Herman and Polivy, 1984, cited in Ruderman, 1986). Thus, it should take greater food deprivation to report hunger and more food consumption to report satiety. In addition, restrainers have a self-imposed "diet boundary" which acts as a maximum consumption which is acceptable. If food is consumed which is perceived to exceed this "diet boundary" then food will be eaten until satiety is reached. Binge eaters are proposed to differ from restrained eaters by eating well beyond satiety when exceeding their "diet boundary". Anorexics, on the other hand, supposedly set their diet boundary closer to the hunger boundary but rarely eat enough to experience transgressing it.

Cognitive/Perceptual Factors in Dietary Restraint

Increasingly, theorizing about obese/nonobese or restraint/nonrestraint differences have involved the differential effects of sensory and cognitive cues. External stimuli such as food cues and social values are cognitively interpreted. Most anorexic, bulimic and even obese individuals are hypothesized to be in a state of semistarvation. Keys et al. (1950) noted that characteristic cognitive symptoms develop during semi-starvation. Included in his observations of normal, semi-starved volunteers were intense (mental) preoccupation with food and ritualistic food behaviors (planning all day how to prepare their food, hoarding food, etc.). Food preoccupation has been well documented in eating disordered populations (Garfinkel and Garner, 1982). Further cognitive aspects

of dietary restraint have been observed in anorexia nervosa subjects by Garner & Bemis (1982). Using categories developed by Beck for depressed patients, they postulated that certain types of cognitive distortions occur in anorexia nervosa including selective abstraction, overgeneralization, magnification, superstitious thinking and all-or-none thinking. Others have suggested that bulimic individuals may have similar cognitive distortions (Fernandez, 1987). Restraint theorists have repeatedly hypothesized that perceptions of having overeaten disinhibit restrained eaters who tend to act in an all or none manner in regard to perceived self-control or will power. Finally, all eating disordered and restrained individuals are dissatisfied with their looks and therefore to a large degree with themselves. They place excessive controls over their bodies in order to gain self-esteem by making their bodies conform to an unattainable standard of beauty which is idealized in western culture. Distortions in perceptions of their actual body shape often occur in the process (Counts & Adams, 1985; Garner et al., 1976; Stein & Brinza, 1988).

Maladaptive Cognitions

Positive correlations have been reported between irrational or maladaptive cognitions and restraint scores (Ruderman, 1986; Stein, 1987). Ruderman found a high correlation between restrainers' scores on the Revised Restraint Scale and several factors on the Rational Beliefs Inventory (RBI) (Shorkey & Whitman, 1977). Examples of maladaptive cognitions and behaviors from the Revised Restraint Scale

include items such as "Would a weight fluctuation of 5 lbs. affect the way you live your life?" and "Do you eat sensibly in front of others and splurge when alone?". Items on the RBI include such actions as relying on external standards to assess behavior, as well as the tendency to avoid and overevaluate frustrating and unpleasant situations. Ruderman (1984) also examined the relationship between bulimia and maladaptive cognitions as assessed by the Bulimia Test (BULIT) (Smith & Thelen, 1984). Ruderman concluded that individuals with high BULIT scores tend to hold rigid, perfectionistic, irrational beliefs, similar to those found by Garner & Bemis (1982) in anorexic subjects. These beliefs reflect particular distorted cognitive styles of reasoning such as dichotomous thinking, overgeneralization, and errors of attribution (Garner et al., 1986; Ruderman, 1986).

Since it is hypothesized that restrained eaters have a rigid set of beliefs, such as those described above, they may have a cognitive style that cannot easily accommodate a breach of dietary restraint. For example, consumption of a milkshake preload (which is presumably perceived as a violation of their restraint), may result in the belief that they have broken their diet and that there is little they can do to rectify their breach. Even anticipating breaches of dieting, or <u>beliefs</u> about the caloric level of a preload have been shown to disinhibit dietary restraint (Polivy, 1976; Ruderman & Wilson, 1979).

Further proof of the importance of cognitive factors in mediating food regulation is found in studies in which subjects are asked to self-monitor their food intake. When self-monitoring cues such as caloric content and bowl size are made clear, counterregulation did not occur more significantly in restrained eaters (Kirschenbaum and Tomarken, 1982). Self-monitoring of food intake has been used successfully in treatment programs for anorexics, bulimics, and overeaters. However, the nature of dietary violations and reinstatement of self-control remain to be fully determined.

Desire for Thinness and Body Image Perception

In the context of dieting and subnormal nutrition, certain cognitive distortions about food, appearance and behavior may become accepted without question. Disturbances in perceptual and attitudinal aspects of body image in which persons feel they look fat despite emaciation was first identified by Bruch (1973) as a defining characteristic of anorexia nervosa. However, a driving desire for thinness has been associated with most abnormal eating behaviors.

Clinical observations and empirical research have suggested that bulimics also tend to have distorted body images. Body image refers to the mental image that a person has of the physical appearance of his/her body in addition to attitudes and feelings towards his/her body (Garner, Garfinkel & Moldofsky, 1978). It is well documented that bulimics frequently indicate discrepancies between perceived and desired body weight, often despite the fact that they were not

significantly over their ideal body weight as depicted by standard height and weight charts (Brinza, 1987; Fairburn & Cooper 1982; Garner & Garfinkel 1982; Katzman & Wolchik, 1984; White and Boskind-White, 1984; Williamson, Kelley, Davis, Ruggiero, & Blouin, 1985). Body image distortion may contribute to or result from the cognitive rigidity with which eating disordered individuals evaluate food, body weight, and dieting. While thinness is thought to be attractive and desirable, fatness is to be avoided at all costs. The extent of body image distortion in eating disordered patients often is predictive of treatment outcome, hence acquiring a realistic body image is important in the recovery from an eating disorder (Garfinkel & Moldofsky, 1977, cited in Garner, Garfinkel & Moldofsky, 1978).

Counts & Adams (1985) had bulimics, normal dieters, normal restrained eaters, and a normal control group without weight concern select body shape silhouettes representing their current and ideal shapes. Their findings did not support the hypothesis that bulimics would overestimate their size or overvalue an ultrathin body size more than would other dieting or restraining females. Therefore, the diet and restrained group resembled the bulimic group in body overestimation whereas the normal controls were significantly more accurate in their self-perceptions than the other groups. In addition, members of the female diet group were not significantly different from the bulimic group in their dissatisfaction with their body shape. All of the experimental groups were more dissatisfied with their shape then were nondieting controls.

Despite the relatively well demonstrated phenomenon of body size overestimation in eating disordered, obese and restrained subjects, and underestimation in normal weight controls (see Garner, Garfinkel, & Moldofsky, 1978), there have been some inconsistent findings. For instance, Garner et al., (1976) observed self-overestimation of body regions in controls as well as in eating disorder groups. In Count and Adams' (1985) study neither the subjects nor the raters (who were females with few concerns about dieting) considered any of the groups to be at an ideal size at present. This included the normal group, who averaged 4.5% below ideal weight. Therefore, desiring to achieve an ultra-thin body and perceiving oneself and others as not having met this ideal standard appears to be present even among normal weight females.

Food Preoccupation

Anorexics typically engage in self denial of hunger and food intake more stringently and successfully than restrained eaters. Interestingly, a paradoxical effect is often seen in that the more anorexics restrict food intake, the more preoccupied with food they become (Garner & Olmstead, 1984). Collecting recipes, cooking and various other food related behaviors often become self-engrossing. These behaviors were also noted in semi-starved volunteers whose conversations, daydreams and reading materials centered around food and eating (Keys et al., 1950). Semi-starved individuals would spend hours toying with food that would normally take only minutes to consume. These preoccupations continued throughout the 12 weeks of

rehabilitation during which time sufficient calories were provided. Food preoccupation is therefore believed to be a direct result of induced starvation. Food preoccupation may also stem from fears of not being able to control one's appetite, which may lead to further restrictive dieting behavior and hence, enhanced food preoccupation.

Food preoccupation has also been noted in bulimics. Bulimics often ruminate over the types and quantities of foods they wish to gorge on well in advance of an actual binge eating episode. Although it has not been studied at this time, it follows that restrained individuals would exhibit food preoccupation as a result of dieting but not to the extent that anorexic and semi-starved individuals display.

Summary of the Role of Cognition and Perception in Dietary Restrainers

Several theories have been advanced to explain differences in weight regulation between groups (i.e. obese versus nonobese, anorexic versus normals). These theories have been reviewed with an emphasis on the cognitive/perceptual differences found between those who actively restrict their dietary intake and those who do not. Although numerous studies have been undertaken to test the externality hypothesis in accounting for differences in eating behaviors among the obese, this hypothesis has not been thoroughly tested in light of new information gained regarding restraint theory. Further, a few studies have used physical measurements

(i.e., intragastric balloons) to measure differences between weight groups, but the majority of studies have used self-report measures.

Restrained eaters and eating disordered individuals exhibit thoughts and behaviors typical of those seen in semi-starved subjects who are otherwise normal. Restrainers and eating disordered individuals complain about being preoccupied with food, as do semi-starved subjects. Similarities may also include more responsivity to external food cues (i.e. sights and smell). Visual cues may play an important role in regulating food intake for restrainers as they appear better able to regulate food intake when they are made consciously aware of the amount and caloric content of foods they are consuming. Further, changing body image distortions to more realistic perceptions is indicative of positive gains made in treatment.

The purpose of this study was to assess whether or not evidence for attentional differences between normals and restrainers exist in regard to food and body image related stimuli. By studying eye movements of normal subjects and food restrainers as they view visual stimuli it is possible to assess if an attentional bias for food and body image stimuli exists. The bias may relate to avowals of food preoccupation and other cognitive factors such as irrational beliefs about food and body image distortion.

Cognition and Individual Differences

Eysenck (1982) argued that differing performances of carefully screened subjects who vary on a psychological variable can illuminate

general laws of cognition. Cognitive factors which differentiate bulimics/restrained eaters from nonbulimics/nonrestrained eaters, such as a preoccupation with food and body image, may indicate a cognitive set or bias towards what information is processed among a multitude of stimuli. Therefore, as these groups vary, so too would cognitive processes, such as attention, be expected to vary in individuals.

Models of Selective Attention

The human ability to direct attention and to choose or reject particular thoughts or perceptions has long been of interest to psychology. James (1890) stated the role of attention in cognition as such: "My experience is what I agree to attend to. Only those items which I notice shape my mind--without selective interest, experience is an utter chaos" (p. 402). James statement is congruent with his contention that the human mind is purposive and actively involved in perception.

The past several decades have seen a number of theories develop in an attempt to explain the process(es) by which individuals rapidly attend to and perceive pertinent information in their environment. During the 1950's, researchers such as Broadbent (1958), proposed that there is a limit to one's ability to attend to all of the stimuli which activate sensory organs at any given moment. This attentional limit creates a bottleneck or narrowing of the incoming flow of information to be processed. Thus the term "bottleneck" was used to describe Broadbent's "filter theory" and similar theories of

selective attention. Broadbent maintained that only stimuli which are attended to can be perceived, and then only one at a time (in a serial manner).

Another approach to attention is the "capacity" model of attention (e.g., Kahneman, 1973). Kahneman suggested that attention consists of a set of cognitive resources which are allocated to possible stimuli according to an allocation policy which decides the amount of cognitive processing to give stimuli. The allocation policy is determined according to long-term (enduring dispositions) and short-term (momentary intentions) tendencies to process particular stimuli. The capacity model asserts that all stimuli register on the senses. A number of incoming stimuli can be attended to as determined by the allocation policy and available cognitive resources, whereas, bottleneck models argue that only one stimulus at a time is actually perceived.

Posner and Snyder (1975) added to the capacity model asserting that two very different types of attention exist. One type of attention is conscious, flexible and limited in capacity, while the other type is automatic, based on prior learning, relatively inflexible, but with a greater capacity. The learned, automatic form of attention, such as watching the white line on the side of the road as we drive, is done with relatively low levels of awareness. Yet, if something were to cross that white line in front of us, we would instantly be alerted to the need to switch over to a more controlled, highly aware level of attention. Conservation of attention for

activities which require higher levels of consciousness is achieved by utilizing lesser amounts of attention on well learned, habitual behaviors in predictable situations. Thus, the capacity model of attention assumes that stimuli do not need to be attended to consciously in order to be processed.

Erdelyi (1974) offered a conceptualization for selective attention which goes beyond delineating a simple model of attention. Based on information processing theory, he proposed that selectivity does not occur at any one particular locus but rather is an on-going process that is "pervasive throughout the cognitive continuum, from input to output" (p.12, 1974). He suggested the more important questions to ask at this point are: At what multiple points in the information processing system, and in what ways does selectivity (bias) intrude upon information processing?

Arousal and Individual Differences

One way that selective attention may affect information processing is the level of arousal an individual brings to a task or displays in response to stimuli. As stated by capacity theory, arousal may vary from moment to moment (momentary intentions) and according to individual traits (enduring dispositions) in determining the amount of attention that will be allocated. An enduring disposition can cause a specific allocation policy for attention to be adopted, particularly when novel and significant stimuli are detected. If individuals vary in what they regard as significant and

demanding of more intensive processing, then attentional differences between individuals will also exist.

Various studies have attempted to demonstrate the effect of individual differences in arousal on perception. Early studies (McClelland & Atkinson, 1948; Sanford, 1936) produced arousal in their subjects by depriving them of food. As noted earlier, when individuals are deprived of sufficient nourishment, they will typically think, dream, and discuss food or food related items. Sanford (1936) derived his hypotheses from Murray's theory of personality. According to Murray, when the needs of an organism are blocked or frustrated, images of objects or situations which might satisfy that need are provoked. Sanford reasoned then that as the tension of a need rises, the unconscious imaginal processes integrated with the need likely have an increasing influence on thought as well as action (Sanford, 1936).

Food deprivation studies have tested arousal using projective techniques such as the word association test (Sanford, 1936; 1937), ambiguous pictures (Sanford, 1936; 1937) and blank screens or ambiguous ink blots (McClelland & Atkinson, 1948) to test perceptions. Hypotheses were generally confirmed that perception is in part a function of arousal as noted in the significantly higher food-related responses of food-deprived versus non food-deprived subjects. However, Sanford noted that the strength of a need itself does not increase directly with time but varies. He based this conclusion on his finding that subjects who had been fasting for 24

hours gave only slightly more food-related responses on average than those observed in subjects going five hours without food (the abstinence period of the normal eating cycle).

Eysenck (1982) summarized the information available which lends support to the various ways moderate levels of arousal may mediate the effects of emotion and motivation on cognition. Following Easterbrook's (1959) theory, moderate levels of arousal may narrow attentional selectivity to only task-relevant stimuli. Further, although there is no confirming evidence of such, increased attentional capacity may hypothetically occur under these conditions as suggested by Kahneman (1973) and Posner and Snyder (1975). In addition, moderate levels of arousal may increase the speed of attentional processes such as learning, remembering and responding, although this may vary in response to task difficulty (for example see Weiner, 1966). Alternatively, as the level of arousal increases so might distractibility from the task increase (Dornic, 1977). Therefore, we can expect that individuals will differ in their attention to various stimuli to the extent that their arousal levels differ.

Perceptual Defense-Vigilance and Information Processing

A view which suggested that the perception of external events is determined in part by internal events such as expectancies, needs, and motives came to the forefront in the late 1940's. This movement, described by Erdelyi (1974), came to be known as the "New Look". A central theme was the role of expectancies and psychodynamic defenses

in filtering and organizing perception. The major impetus for this hypothesizing stemmed from research conducted by McGinnies (1949). He discovered that taboo or emotionally laden words presented tachistoscopically took longer for subjects to report than socially acceptable words. Two prominent hypotheses were developed to explain perceivers' strategies for dealing with stimuli of emotional or crucial importance. Perceivers could either try to suppress (perceptual defense) or enhance (perceptual vigilance) stimuli as a function of their meaning to the individual. The difference between these two processes rests on the level of the recognition threshold. A relative lowering of recognition thresholds to emotional stimuli exists when perceptual vigilance is enacted; while recognition thresholds are believed to be elevated during perceptual defense.

Erdelyi's reformulation of the perceptual defense-vigilance effect in information-processing terms came about in an effort to revive this concept after major criticisms raised against it in the late 1950's made the concept fall into disrepute. The criticisms leveled against perceptual defense-vigilance came about, to a large extent, because of the dominance of behaviorism in psychology at that time. However, with the increase in interest in the process of selective attention, cognitive activities resurfaced and began to be conceptualized in terms of information processing theory. Erdelyi made the case that the perceptual defense-vigilance effect is a special instance of selectivity in cognitive processing. By Erdelyi's account, response-bias, which had been used in the

criticisms of the New Look, was actually a prominent part of perceptual theory. Defensive selectivity is pervasive throughout information processing, from input to output (Erdelyi, 1974). Therefore, in keeping with New Look theory, the perceiver takes an active role analyzing one's perceptions. Both conscious and unconscious mental activities intervene between a sensation and a person's response to it (Leahey, 1987).

Attention Operationalized as Eye Fixations

The use of eye movement measurement technology is becoming increasingly prominent in research on attention and perception. It provides a means of measuring cognitive processes in an external, ecologically valid, nonthreatening, and nonsocially biased manner. According to Rayner (1978), early attempts to study picture viewing, and the cognitive processes involved, relied on single tachistoscope exposures. Current use of eye movements to illuminate cognitive processes are credited with providing a more accurate representation of how we attend to visual information from a stimulus display in the laboratory and in real life (Rayner, 1978).

Russo (1978) detailed how eye movements are used by the cognitive system. Eye movements, as a means of acquiring external information, are represented as requiring approximately the same amount of time (effort) as it takes to acquire or retrieve a single piece of internal information from long term memory (LTM), such as a name. According to Russo, just as short term memory is the center of internal attention, so is the fovea the center of external visual

attention. Hence, attention shifts can be operationalized as eye movements due to the parallel manner in which internal shifts in attention operate in relation to external eye movements. This thus involves equating the item which has its image fixated on the fovea with the attended object. Russo further stated that since the great majority of eye movements serve, and are controlled by cognitive processes, "interpreting" eye fixations should imply identifying the underlying cognitive strategy.

It should be noted that there are some who would debate the appropriateness of equating eye fixations with attention. The debate involves two issues. The first point, made by Hochberg (1970), is the ability of two people to report seeing different objects when focussed on identical (though ambiguous) figures and the ability of an individual to fluctuate between reporting one versus the other object by switching attention without making an eye movement (Hochberg, 1970). The second argument against using eye movements as a measure of attention, made by Schulman, Remington & McLean (1979), includes the fact that individuals can shift attention in the visual field by looking out of the corner of their eyes, without necessitating an eye movement. However, these appear to be rather infrequent phenomena in comparison to individuals' reports of awareness of objects that are fixated on.

Measurement of Eye Fixations

Visual scanning of a picture involves saccadic eye movements. The saccadic eye movement system can be divided into fixations and

saccades. Fixations occur for a brief period of time (200 - 500 milliseconds) during which the eye is still and focused on a single part of the picture encompassing 1 - 5 degrees of visual angle. Saccades are extremely rapid movements which separate fixations. The purpose of saccades is to direct the eye to a new section of a scene. According to Antes (1985) viewers move their eyes between two to four times per second in examining a picture. Saccades are so quick that they operate without conscious awareness and occupy only about 5% of total time spent scanning a picture (Spoehr & Lehmkuhle, 1982).

The most widely used measures of eye movement are fixation number (how many times a particular area is fixated), fixation duration (amount of time the eye is fixated on an area), interfixation distance (distance between fixation points) and gaze (total fixation time per area). As explained by Antes, Chang, and Mullis (1985), fixation number usually indicates the areas of greatest interest, fixation duration indicates the amount of time required to encode and interpret fixated information, and interfixation distance indicates the range of peripheral vision used or the "useful field of view".

Just and Carpenter (1976) have suggested that at times, consecutive fixations on the same part of the stimulus (gaze time) represent the most appropriate unit of analysis for fixation time. However, according to Rayner (1976) for theories of information processing of picture perception, the unit of an unaggregated fixation duration may represent the most appropriate unit of

analysis. Russo (1978) cautioned that each of these suggested units of analysis has potential pitfalls. He argued that fixation duration may not be a valid measure of the time actually spent in cognitive computation. On the other hand, the value of using gaze durations rests heavily on the ability to identify a group of fixations comprising a cognitive unit.

Eye Fixations and Picture Viewing

Why do we look where we do? James (1890) perhaps stated it best: "Millions of items of the outward order are present to my senses which never properly enter into my experience. Why? Because they have no interest for me." (p.402) Several clues have been found since James' time which have increased our ability to respond to this question. Individuals typically scan the visual field when viewing pictures according to what objects, areas, contours or outlines will provide the most information.

One way of operationalizing visual interest is to determine how much information about the total picture is conveyed by each segment of a picture and then measure eye fixations on those segments. Mackworth and Morandi (1967) were the first researchers to develop a means of measuring the informativeness of picture segments in this way. They cut a picture into equal parts and had subjects rate them according to "informativeness". Next they had a separate group of subjects view the intact picture. The researchers found that areas of pictures containing the greatest amount of "informativeness" about the picture tended to be fixated the most. In their study, which

used pictures low in content meaning (i.e. aerial photograph of a land mass), informative regions were areas that contained unusual details or unpredictable contours.

Antes and Stone (1975) also attempted to illuminate the factors involved in the judgment of information value in picture viewing. They used a similarity analysis model of multidimensional scaling (Stone & Coles, 1970) which extracts common hypothetical dimensions based on judgments made by subjects of regions within a picture. To relate the obtained dimensions to behavior, the factor loadings were correlated with density of eye fixations, mean duration of eye fixation and individual ratings of informativeness for each segment of the picture. Five factors were found to account for 86% of the mean judgmental similarity variance between pairs of the picture sections following varimax rotation: 1) presence vs. absence of information, 2) left vs. right, 3) meaningfulness, 4) inner vs. outer, and 5) foreground vs. background. The two factors which most clearly demonstrated informativeness were the "picture content" factors (1 and 3), with "meaningfulness" attracting a significantly greater degree of density ($-.44$, $p < .05$) and duration of eye fixations ($-.47$, $p < .01$) (Antes & Stone, 1975). They therefore demonstrated the importance of "meaningfulness" of picture regions to individuals during visual exploration of pictures.

Another aspect of informativeness which may influence eye movement patterns includes the presence of unexpected objects or the absence of expected ones. This phenomenon has been examined

experimentally by Loftus and Mackworth, (1978). When absurd or out-of-context items (e.g., an octopus in a farm scene) were placed in pictures Loftus and Mackworth found subjects fixated sooner and longer on these items than on expected objects.

In addition to the characteristics of informativeness described here (meaningfulness and novelty), affective value, complexity, significance, color, contour, movement, and context of pictures have been found to affect looking behavior (Antes & Penland, 1981; Berlyne, 1960, cited in Kahneman, 1973; Gould, 1976).

Eye Fixations and Individual Differences

Eye fixation measurements reflect the cognitive processes that occur within that fixation period (Gould, 1976; Rayner, 1978). Variability found in eye movements is not random. It reflects individual variability due to the processing activities involved under voluntary control. In response to stimuli, the needs, values and previous experiences of individuals can determine what they find interesting or arousing and therefore influence eye movement patterns.

One individual variable which has been shown to influence visual searches and attention is level of motivation or need. Monty, Hall and Rosenberger (1975) found differences existed between addicts and controls in their reaction to emotionally loaded words (i.e., "drug" or "dirty words") and pictures (drug paraphenalia) or neutral words or pictures (wallets, ashtrays, etc.). They found that addicts spent substantially more time looking at drug and dirty words than did

controls. However, differences between addicts and controls existed even for the neutral word category. This suggests that there may be two types of differences between addicts and controls: differences produced by the motivational aspect of the drug and dirty words, and differences caused by some more basic phenomenon stemming from the rate at which information is processed (Hall, 1976).

Further studies indicating the influence of individual personality differences and needs on eye movements have been summarized by Kahneman (1973). He cited studies in which extroverts preferred to look at a picture of a party than at a picture of a lone man reading a book (Bakan & Leckart, 1966), and "repressors" avoided a bare-breasted woman in a picture and concentrated instead on a man reading a newspaper (Luborsky, Blinder & Schimek, 1965).

Another individual difference found to affect the cognitive control of eye movements is that of degree of knowledge about the stimulus. Different degrees of knowledge should result in different eye fixation patterns. Welland (1969) suggested that the perceiving person tends to develop an efficient way of information uptake during a process of learning that should modify the fixation pattern. There is a variety of research recently undertaken which examined differences in eye movements between experts, who have developed efficient means of examining important visual data, and novices (Kundel & Nodine, in Senders, Fisher & Monty, 1978; Kundel, Nodine, & Toto, in Gale & Johnson, 1984; Mockel & Heemsoth, in Gale & Johnson, 1984).

Mockel and Heemsoth (1984) used groups of students, athletes, and coaches with varying degrees of knowledge regarding the motion pattern in shot putting. As hypothesized, subjects with more knowledge about the motion patterns showed a significantly higher mean frequency of eye fixations at points that reflect critical information of proper shot putting motion than those with minimal knowledge. They concluded that the amount of information gained from a visual stimulus depends on factors relevant to the stimulus as well as what a subject knows about the stimulus. Therefore, strategies in visual search may be developed or modified with changing cognitive states, even though it may only be to a limited degree.

The knowledge that experts' eye movement patterns differ from novices' has important implications for those in professions such as radiology and aeronautics which rely on visual information display modes to make critical decisions. The core question being explored by researchers in this area is how to teach individuals in these fields efficient information pick-up and processing. For the purposes of this study, it is sufficient to note that individual differences in eye fixation patterns are present in many tasks. Reasons given for these noted differences include motivation, rate of processing information, needs, and degree of experience or knowledge about the stimulus.

Purpose of the Present Study

The purpose of the present study was to investigate possible individual differences in attention of restrained and nonrestrained

eaters by comparing their eye fixations during picture viewing. The rationale behind bringing together two very different and previously never associated bodies of literature (restraint and eye movements) is based on the need to test more thoroughly the Boundary Model hypothesis as it relates to normal weight restrained versus nonrestrained individuals. Heightened visual attention to food and body image cues can be conceptualized as an external orientation (cognitive strategy) adopted by restrainers either as a result of food preoccupation (food cues) or as an aid to achieving the highly motivating goal of a slim figure (body image cues). Differences between restrainers and nonrestrainers in their response to food cues likely reflects differences in enduring dispositions as well as momentary intentions. This was demonstrated most clearly by research conducted by Keys, et al., (1950) in which semi-starved subjects spent inordinate amounts of time thinking about food, planning meals, shopping for food, cooking for others, and so on. Some of these "momentary intentions" persisted even after they were returned to a normal diet, to the point that they could be called enduring dispositions (i.e. three of the volunteers changed career goals from nonfood related ones to becoming chefs).

Long-term experiences and beliefs regarding food intake and ideal body weight may result in a cognitive set or bias towards what information is processed among a multitude of stimuli. This bias would be evident by a disproportional allocation of attention towards food and body image stimuli. Measurement of the food preoccupation

prevalent among eating disordered groups and groups of normal, semi-starved individuals has relied, for the most part, on self-report. However, there is an advantage to measuring visual attention by eye movement recordings because of the ability to measure externally what individuals deem informative or interesting without their awareness.

In this study, restrained and nonrestrained normal weight college females were chosen to participate on the basis of their responses to the Revised Restraint Scale. Subjects were asked to fast for a period of approximately 5 hours preceding the laboratory experiment. Half of the members from each group received a milkshake preload in order to eliminate physical hunger, while the other half were not given a preload. There were therefore two independent variables, Restraint vs. Nonrestraint and Milkshake vs. Fasting. Then, all subjects were monitored by eye movement equipment as they viewed twelve slides. Six of the slides contained scenes with food or women of various body shapes, the other six contained reading or study material. Dependent variables were the number of fixations, total fixation time, and the amount of time it took to focus on critical items from the beginning of the viewing period.

In this 2 X 2 design, there were three predictions which were examined. First, subjects not receiving a preload should be hungry and therefore display a heightened preference for viewing food items. This should result in a higher number of eye fixations and higher total fixation time on regions containing food items, and a shorter

time span prior to their focusing on food items than those who received a preload.

It was further hypothesized that restrainers develop an enduring preoccupation with food. Thus, it was expected that restrainers would show a preference for viewing food cues over nonrestrainers. This characteristic should have resulted in a higher number of fixations and total fixation time on food items.

The final prediction was that body image regions would attract a greater fixation number and amount of time in the restrainer groups than the nonrestrainer groups. Although there is not much direct support for this hypothesis in the literature, clinical reports indicate that eating disordered individuals perceive themselves as fat although they are quite thin. They spend an inordinate amount of time weighing themselves and viewing their bodies in mirrors. In order to achieve an ideal body image, much attention must be drawn to comparing one's body shape with others. This may lead to an observable focus on body shapes.

In summary, for individuals deprived of food, food cues were expected to have increased saliency than for those who were satiated by the milkshake. Thus, those who abstained from food were expected to focus their attention quickly and demonstrate increased fixation frequency and duration on food items. Whereas nonrestrainer fasters were predicted to attend selectively to food items due to physical hunger, restrained subjects, including those who were given a milkshake, were expected to show eye movement patterns similar to

fasting nonrestrainers because of their persistent preoccupation with caloric intake and chronic cycling of food deprivation and overeating. The ultimate goal of dietary restraint for restrainers is to maintain a culturally admired, slim figure. Restrainers were therefore also expected to demonstrate selective attention toward body image cues with longer fixation numbers and amount of time whereas nonrestrained subjects were not expected to show this pattern.

CHAPTER II: METHOD

Design

This study utilized a 2 by 2 factorial design. There were two between-subjects independent variables. The first independent variable, Restraint, was represented by two types, either Restrained eaters or Nonrestrained eaters. Restrained eaters were defined as those who scored 19 or above on the Revised Restraint Scale; nonrestrained eaters scored from 0 to 11. Half of each of the subjects in these two groups were then randomly assigned to one of two conditions which made up the second independent variable, Fasting. Fasting consisted of two conditions: 1) Fasting (no milkshake preload) or 2) Milkshake (those who were given a high caloric milkshake preload). Differences between subjects' weights were controlled for by only using subjects within 90% - 110% of the average weight range for their height according to 1983 Metropolitan Life Insurance Figures.

The dependent variables were eye movement measurements which represent visual attention. Of main concern in the present study were the effects of the independent variables on three dependent variables: 1) total number of fixations, 2) duration of eye fixations, and 3) latency time to first fixation on critical regions.

Screening and Subject Selection

Four hundred seventy-five female students in undergraduate psychology courses participated in the screening. The screening battery for this study consisted of a consent form (Appendix A),

and the Revised Restraint Scale (Appendix B). Several questions regarding height, weight, vision and accessory information were included with questions from the Revised Restraint Scale (Appendix C). Subjects also completed screening materials for other research projects which were being conducted during the semester. Several reading skill exercises were included in the screening battery for the other studies. Therefore, students participating in the present study were unaware of the selection criteria used.

Classification of restraint was made using the Revised Restraint Scale (Herman, 1978). Subjects were identified as Restrained if they obtained a score of 19 or above on the Revised Restraint Scale, and as Nonrestrained if their scores fell at 11 or below and they were not currently dieting. Females scoring 18 or above have been shown to exhibit chronic dieting behaviors and an excessive concern with dieting in comparison to lower scorers'. Subjects were initially chosen from the pool of screened students based upon scores obtained on the Revised Restraint Scale (RRS), normal vision without glasses or with soft contact lenses (because of the eye movement apparatus), and average weight for their height. Due to the experimental design, subjects were excluded from participation if responses to the questionnaire indicated they were overweight, allergic to chocolate, diabetic, pregnant, wore glasses or hard contact lens, or were on medication.

Female students who met the criteria for Restrained or Nonrestrained eater were initially going to be selected based on

stratified random sampling, however all subjects who met the criteria for the restrainer group were contacted due to the limited number. Subjects were contacted by phone and invited to participate in a study on the effects of eating habits and hunger on study skills. The necessity of near 20/20 vision or use of soft contacts for the study was explained. Subjects were informed that in order to assure similar hunger levels among participants at the time of the experiment they would need to abstain from food, caffeine and stimulants for 4 hours prior to the experiment. Thus they could eat their usual breakfast and lunch but nothing following the lunch meal around 12:00. If students met the criteria, agreed to participate, and were free for one-half hour between 5:00 and 6:30 in the evening, they were scheduled for the experiment. Phone calls were made to subjects the night before their scheduled date to remind them of the study the following day and not to eat anything following the lunch meal.

Experiment Procedures

Questionnaires. All subjects were run individually at approximately the same times of day (5:00 - 6:30 PM) in order to increase control over satiety effects. Data collection was completed in a research room located in the Psychology Department building. Random assignment within the two groups of Restraint were made to either the Milkshake or Fasting conditions. Upon entering the laboratory subjects read and completed a consent form which described the study and stated they may be asked to drink a milkshake to

control for the effects of hunger on their level of concentration (Appendix D). After signing the consent form, subjects then completed a physical status form (Appendix E) which asked several questions regarding their present state which may affect their performance. Questions also addressed whether they had indeed fasted and several questions concerning their study habits and grades were included to emphasize the supposed study skills aspect of the experiment.

Subjects who did not receive the milkshake then completed the 20-item A-State Scale of the State-Trait Anxiety Inventory by Speilberger, Gorsuch and Lushe (1970; Appendix F). The A-State scale has been successfully used as a research tool for determining the levels of anxiety intensity induced by stressful experimental procedures, or as an index of drive level as defined by Hull and Spence (Speilberger et al., 1970). Subjects in the milkshake conditions were asked to drink the ice cream milkshake before completing the A-State Scale.

Preload administration. Each milkshake given to subjects was individually made from a recipe (See Appendix G) by the same research assistant to assure the same number of calories in each milkshake. All of the subjects in the milkshake condition were read the following instructions: "The first thing we would like for you to do is to drink this high calorie milkshake to give you some energy. It is equivalent to a normal meal, about 800 calories. Please drink the entire milkshake." After finishing the milkshake, subjects completed

the A-State Scale and were brought to the room containing the eye monitor equipment.

Eye movement apparatus. Eye movements were recorded using a Gulf and Western Eye View Monitor, model 1994S. The subject sat in an adjustable chair with her head in a chin rest 46 inches from the white projection screen. The Eye View Monitor used a low intensity infrared beam of light to find the relative location of the pupil center and corneal reflection in order to determine eye fixation sites. The X and Y coordinates of eye fixations were recorded 60 times per second. These data were then translated into fixation points using a computer program described by Kliegl and Olson (1981). Three monitors facing the experimenter allowed for unobtrusive viewing of the subject's face, the slide being viewed, and a close up of the subject's pupil and cornea to track subject's eye fixations (LaBarbera, 1987).

Pictures. A total of twelve slides were shown to subjects. Six of the slides contained either written paragraphs or maps. These slides have been used in previous eye movement studies. They were included to foster the belief that the study was examining study skills. The slides of interest to the purpose of the actual study were six slides: three depicted a range of body image sizes and three contained situations with food. Food and body image slides were prepared from pictures taken by the researcher of scenes that were likely to be seen on a college campus. The pictures included food items or people as prominent parts of the pictures but also contained

various other objects to which viewers' attention may be drawn. Figures 1-6 in Appendix H show the pictures schematically. Critical regions in the slides were defined as any human figure below the neck and shoulder area (body image cues) and any edible items present (food cues). The projected images were approximately 26 inches wide and 17 inches high (32 degrees of visual angle wide by 21 degrees high) at the viewing distance of 46 inches.

Picture viewing procedure. In order to explain the necessity of using the eye-movement equipment and slides, subjects were told that the study involved measuring aspects of their visual perception of words and pictures used during studying. Subjects were adjusted in their chair so that they could sit comfortably with their chin on the chin rest. The subject's eyes were then calibrated with the eye movement recorder. The calibration procedure utilized a slide with the letters A through I situated in three rows and three columns which formed a square with the letter A in the center (Figure 7, Appendix H). Subjects were requested to fixate on each of the letters in alphabetical order while adjustments where made to the relative positioning of the pupil center and corneal reflection. Then horizontal and vertical crosshair controls were adjusted to an individual's X and Y coordinates for each of the letter positions were recorded by the computer program. Subjects whose eyes could not be reliably calibrated (i.e., too teary, astigmatism) were informed of this, received credit for participation, and dismissed.

After calibration, subjects were instructed on the procedure for viewing the slides. Each slide was shown for 20 seconds. Food and body image slides were always preceded and followed by a study skills slide. Experimental slides alternated between food and body image scenes and were kept in the same order. Counterbalancing was achieved by rotating the leading experimental slide by one position each trial. This resulted in a series of six presentations where each slide occupied a different ordinal position. Each series was presented at least two and no more than three times for each experimental group. Some time between slides was taken for subjects to rest their eyes and for the experimenter to make adjustments in the equipment.

There were several extenuating circumstances which necessitated obtaining eye movement data on a large number of subjects (N=78) in order to obtain usable data for sixty subjects. Twenty-three percent (N=18) of the subjects were excluded due to equipment or human error. The primary reasons for equipment and human errors were difficulty calibrating subjects' eyes due to astigmatism and failure to cue the computer to record the eye movements prior to each of the six experimental slides being shown.

Height and weight measurements. The final step of the study was to obtain height and weight measurements. Height was measured by a tape measure which was adhered to a door in the same position throughout the study. A standard bath scale was used to weigh subjects. Subjects were given permission to remove their shoes prior

to weighing. An attempt was made to use only subjects who were within 90 - 110% of the average weight range for their height (see Metropolitan Life Insurance Company Weight Table for Women - Table 27, Appendix I). However, so many restrainers exceeded the upper range limit when actual weights were procured that several who were two to three pounds over the set limit were included.

After measurements were taken, subjects were given their extra credit slips and any questions they may have had were answered. Subjects were informed of a meeting time which would take place following completion of the study during which time they would be debriefed as to the actual purpose of the study and any further questions would be answered. The researcher's phone number was also given if subjects had any further questions or problems stemming from participation in the study.

Total amount of time required for all of the above procedures ranged from 20-40 minutes depending on experimental condition and length of time required for calibration.

Informativeness Ratings

Informativeness ratings of the pictures were gathered as a means of delineating regions of the slide that would commonly be looked at by subjects to gain information about the picture versus regions that would not be expected to draw considerable attention. Forty undergraduate female subjects who had not participated in the eye movement experiment were recruited from undergraduate psychology

courses to rate the informativeness of objects within the pictures used (see Appendix J for consent form).

The picture slides were projected onto a large screen. For each slide, objects were grouped into meaningful categories (i.e. food items, electronic equipment, furniture). Subjects were instructed to assign a number to each of the categories indicated which would represent the percent of the amount of visual information contained within that category relative to the entire picture (see Appendix K for rating sheet).

Visual information was defined as both the visual features and the meaningfulness of the items to their overall understanding of the picture. Ratings were then summed and mean scores obtained for each area to determine an information score for each area containing food or body cues relative to other items in the pictures. Information density scores were than determined by dividing the mean information score by the percent of the slide area the item occupied.

CHAPTER III: RESULTS

Sample Characteristics

Screening Population

A total of 475 females were screened with the Restraint Scale in various psychology courses over a semester and two summer sessions (see Table 1). Only subjects who scored between 0-11 (Nonrestrainers) or 19-30 (Restrainers) and met weight requirements were considered for the remaining portions of the study. As seen in Table 1, a large percentage of subjects was eliminated from further consideration due to their score ranging from 12-18 (28.8 %) or by their not meeting weight requirements (28.6%). The number of subjects for use in the eye movement portion of the study was further reduced by excluding those who wore glasses or hard contacts. A small percentage (3.7%) of the screening data was discarded due to subjects not providing information about their height and weight or because they failed to complete one or more of the questions on the Restraint Scale.

Eye Movement Subjects

Of the 475 females screened, 118 were contacted by phone to participate in the remainder of the study (see Table 2). Of those contacted, 20% refused to participate and an additional 14% did not report for the experiment after consenting. Thus 66% of those contacted by phone completed the experiment. Subject refusal was largely due to their already having the maximum allowed for extra credit participation or by their not being able to fit the experiment

Table 1

Subject Screening Data

Weight(a)	Restraint Score	N	% of Total
Average or less	0 - 11	109	22.9
	12 - 18	137	28.8
	19 - 30	75	15.8
			67.5
Overweight	0 - 11	7	1.5
	12 - 18	69	14.5
	19 - 30	60	12.6
			28.6
Incomplete Information		16	3.3
Errors		2	.4
			3.7
Total		475	99.8(due to rounding)

a Based on Metropolitan Insurance Company Tables (1983).

Table 2

Subject Refusal Data

	Nonrestrainer		Restrainer		Combined	
	N	%	N	%	N	%
Refused to participate	10	9	14	11	24	20
Did not show up	5	4	11	9	16	14
Total subjects run	36	31	42	36	78	66
Total Contacted	51	43	67	57	118	100

Note. The majority of respondents refused to participate when called due to already having the maximum amount of extra credit allowed in a given Psychology course. However, one Restrainer refused to drink the milkshake.

times into their schedules. Somewhat more Restrainers than Nonrestrainers did not participate (25 vs. 15, respectively). However, mean restraint scores were not significantly different between Restrainers who refused and those who participated (22.8 vs. 22.4, respectively). Therefore the experimental sample was not likely to have been substantially altered as a result of the moderate response rate.

Subject Characteristics

Several questions dealing with subject variables such as height, weight, eyesight and other pertinent information were asked during the screening and eye movement experiment. Table 3 summarizes subjects' responses. Despite the fact that Restrainer and Nonrestrainer groups were of essentially the same height, the Restrainer group as a whole tended to weigh more ($t= -2.14$; $p < .05$). As expected, scores on the Restraint Scale were significantly different between the Restrainers and Nonrestrainers ($t=-20.20$; $p <.0001$). The remainder of subject characteristics, including hours spent sleeping the preceding night and amount of time fasting before the study were similar between the two groups.

One of the problems encountered in running the subjects was the presence of Restrainers who underestimated t weight during the screening. These subjects had to be excluded from the study after their eye movement data were collected and height and weight measurements taken (Table 4).

Table 3

Mean Scores and T-Test Results on Sample Control Questions for Restrainer and Nonrestrainer Groups

Variable	Restrainer Mean	Restrainer SD	Nonrestrainer Mean	Nonrestrainer SD	t values
Age	21.4	(4.5)	21.4	(4.7)	-.03
Height (in.)	65.2	(2.3)	65.3	(2.2)	.14
Weight (lbs.)	131.4	(13.0)	124.7	(11.3)	-2.14*
Restraint Score	22.4	(3.1)	8.1	(2.3)	-20.20**
Hours slept preceding night	6.6	(1.5)	7.1	(1.3)	1.37
Time since eating	5.9	(1.3)	5.6	(1.0)	-1.11

Note. * $p < .05$; ** $p < .0001$. The degrees of freedom are 58.

Table 4

Experimental Subject Data

	Nonrestrainer N	Nonrestrainer %	Restrainer N	Restrainer %	Combined N	Combined %
Could not use data	6	8	12	15	18	23
Overweight	(0)	(0)	(6)	(7)	(6)	(7)
Other	(6)	(7)	(6)	(7)	(12)	(15)
Useable data from	30	39	30	39	60	77
Total subjects run	36	46	42	54	78	100

Chi square analyses were performed to determine if there were differences between Restrainer and Nonrestrainer groups in their desire to eat (an indication of hunger), and subjects' level of alertness. As shown in Table 5, no significant differences were found.

Table 5

Chi-Square Results of Physical Status for Restrainer and Nonrestrainer Groups

	Restrainer		Nonrestrainer				
	N	%	N	%	df	X^2	Prob
Desire to eat(a)					3	.55	.48
no desire	1	1.67	2	3.33			
minimal desire	8	13.33	6	10.00			
moderate desire	18	30.00	15	25.00			
strong desire	3	5.00	7	11.67			
Level of alertness(b)					3	1.97	.11
highly alert	2	3.33	1	1.67			
moderately alert	7	11.67	8	13.33			
average alertness	14	23.33	20	33.33			
low alertness	7	11.67	1	1.67			
very low alertness	0		0				

a 25% of the cells had expected counts less than 5. Chi-square may not be a valid test, therefore Yates Correction was used.

b 50% of the cells had expected counts less than 5. Chi-square may not be a valid test, therefore Yates Correction was used.

Because previous paradigms which administered a food preload to Restrainers resulted in an increase in their reported anxiety, it was anticipated that Restrainers would report similar elevations in their

level of anxiety in the current study following ingestion of a high calorie milkshake. A Restraint (Restrainers/Nonrestrainers) by Fasting (Fasting/Milkshake) analysis of variance found Restrainers scoring significantly higher than Nonrestrainers as expected (Table 6; $F(1,56) = 7.13$; $p < .01$; Means in Table 7). However, there was no Fasting effect or Restraint by Fasting interaction. Thus, both

Table 6

ANOVA Summary of Anxiety Scores: Restraint by Fasting

Source	df	Sum of Squares	F	Significance
Restraint (RES)	1	470.40	7.13	.0099
Fasting (FAST)	1	2.40	.04	.8495
RES X FAST	1	52.27	.79	.3773
ERROR	56	3695.87		

Table 7

Mean (and Standard Deviation) Anxiety Scores: Restraint by Fasting

		Nonrestrainer	Restrainer	Total
Fasting	$\bar{x}$	33.80	37.53	35.65
	sd	7.78	9.44	
Milkshake	$\bar{x}$	32.33	39.80	36.05
	sd	5.27	9.29	
Total		33.07	38.67	

Restrainer groups indicated high anxiety scores in comparison with Nonrestrainer groups. Although the Restrainer group who received the milkshake preload had the highest mean anxiety score, the anxiety induced by the preload did not appear sufficient in itself to differentiate significantly restrainers who did not receive the preload.

Eye Movement Data

The predictions of this study can be summarized as the following: 1) fasting subjects would spend more time and effort looking at food items than those receiving the milkshake; 2) the Restrainer milkshake group would show more interest in the food items than the Nonrestrainer milkshake group and 3) Restrainers would show a greater preference for viewing female body-images than the Nonrestrainer group. The remainder of this chapter evaluates these hypotheses using various eye movement measures as the dependent variables.

Food and Body Image Interest Analysis

Fasting and Restrainer subjects were hypothesized to prefer viewing food items over other items in pictures more than other subject due to hunger (Fasting subjects) and chronic dieting (Restrainer subjects). Similarly, Restrainers were hypothesized to spend more time looking at body shapes than other objects in pictures in comparison to Nonrestrainers. Three slides contained food and three slides contained various body shapes along with other items of interest. The hypotheses were tested in several ways. The first test was to compare the percentage of fixations on food/body items (also

referred to as critical items) between those who were given milkshakes and those who remained fasting. Another indication of preferential viewing can be found by calculating subjects' total time (or gaze) viewing critical items compared to nonfood/nonbody (noncritical) items. A further measure, duration, indicates the mean amount of time per eye fixation spent viewing critical items in comparison to time spent looking at noncritical items in the slides. The amount of time elapsing before fixating on a critical item, either measured by number of fixations or total time, can also be compared across groups. The salience or interest of the food or body image cues to viewers was further measured by the distance the eye travelled to these items from other areas of the slide. This measurement is referred to as the mean interfixation distance. Finally, interest or mental effort can be inferred by comparing the mean pupil size of subjects while viewing critical items versus noncritical items.

Percent fixations. To obtain a measure of percent fixations, each subject's number of fixations on critical items was divided by the total number of fixations. This number was then used in two different analyses. One way of conceptualizing percent fixations is to view it in the context of the amount of area on the slides that critical items occupied in comparison to the total area of the slide. The size of the critical items in comparison to the total slide area varied somewhat from slide to slide (Table 8). Body image items occupied considerably more space on respective slides than did food items. In order to control for these differences the number of

fixations for each subject to each food or body region was divided by the percent area these regions occupied on the slide. A three-factor

Table 8

Area (arbritrary units), Percent Area, Mean Information Rating and Information Density For Slides

Slide Number	Total Area of Slide	Area of Crit Regions	Percent of Slide	Mean Info Rating	Info Density (Info/%Area)
Body					
1	486.89	25.46	5.23	17.10	3.27
3	452.01	108.42	23.99	18.10	.75
5	473.48	63.25	13.36	13.30	1.00
Food					
2	478.66	21.07	4.40	10.85	2.47
4	455.88	18.96	4.16	6.25	1.50
6	437.88	10.08	2.30	10.60	4.61

analysis of variance, Restraint (Restrainers/ Nonrestrainers) by Fasting (Fasting/Milkshake) by Content (Food/Body-Image) with repeated measures on the last variable, was then performed. The results of this analysis are presented in Table 9. Mean percent fixation frequencies per unit area to food and body image regions of the slides are presented in Table 10. There was a main effect for Content (all subjects fixated more on body image areas than food areas), however, no other significant main effects or interactions were detected. The group with the highest mean percent fixation frequency was the

nonrestrained fasters, with the means of the other three groups more closely approximating each other.

Table 9

ANOVA Summary of Percent Fixations Per Unit Area on Critical Regions: Restraint by Fasting by Content

Source	df	Mean Squares	F	Significance
Fasting	1	.184	.969	.330
Restraint	1	.078	.413	> .500
Fast X Res	1	.444	2.431	.132
Subjects	56	.190	Not Tested	
Content	1	14.386	120.267	< .001
Fast X Content	1	.211	1.762	.190
Res X Content	1	.187	1.563	.217
Fast X Res X Content	1	.006	.051	> .500
Subjects X Content	56	.120	Not Tested	
Total	119	.276		

Table 10

Mean (and Standard Deviation) Percent Fixations Per Unit Area: Restraint by Fasting by Content

		NonRestrainer		Restrainer		Total
		Fast	Milk	Fast	Milk	
Body	$\bar{x}$	.443	.342	.364	.477	.407
	sd	.293	.125	.145	.200	
Food	$\bar{x}$	1.030	.830	.842	.857	.890
	sd	.382	.125	.380	.308	
Total		.737	.586	.603	.667	

Another method of determining whether Fasters were more preoccupied by food items than Nonfasters is to look at percent fixations in the context of both the amount of space occupied and the amount of information or "meaningfulness" contained in critical items relative to the whole picture. This measure, defined as information density by Matthews and Antes (1989), has only recently been used. The formulation of information density was designed to eliminate confounds resulting from some items within the slides occupying a larger relative proportion of the total area of the slide as well as some items containing more visual interest or content information than other items. In the current study, information density was determined from ratings given by an unscreened population of females as discussed in the Methods chapter. An information density score was then obtained by dividing the mean information rating of a particular area by the percent of the slide which that area occupied. Data regarding the amount of area, mean information ratings and information density percentages for each of the food and body image slides can be seen in Table 8. Therefore, in an attempt to control for the relative amount of informativeness the various items contained, the three factor repeated measures ANOVA used to analyze percent fixations per unit area was rerun using percent fixations per unit information density as the dependent variable, with the results found in Table 11 (means are found in Table 12). Again, a significant Content effect was present; however no other main effects or interactions were significant.

Table 11

ANOVA Summary for Percent Fixations Per Information Density on Critical Regions: Restraint by Fasting by Content

Source	df	Mean Squares	F	Significance
Restraint (Res)	1	.0572	.320	> .500
Fasting (Fast)	1	.611	.341	> .500
Res X Fast	1	.326	.182	> .500
Subject (S)	56	1.789	Not Tested	
Content	1	67.191	69.799	< .001
Fast X Content	1	.600	.623	.434
Res X Content	1	.185	.192	> .500
Fast X Res X Content	1	.006	.006	> .500
Total	119	1.879		

Table 12

Mean (and Standard Deviation) Percent Fixation Frequency Per Information Density: Restraint by Fasting by Content

		NonRestrainers		Restrainers		Total
		Fast	Milk	Fast	Milk	
Body	$\bar{x}$	3.23	3.08	3.14	3.17	3.16
	sd	2.12	1.14	1.22	1.13	
Food	$\bar{x}$	1.96	1.63	1.56	1.46	1.65
	sd	1.00	.64	.78	.65	
Total		2.60	2.36	2.35	2.32	

Gaze. As mentioned previously, another possible way of determining one's interest in a particular set of objects above that of other items presented is to accumulate the total amount of time, during each 20 second viewing period, that was spent looking at food/body-image items. This measurement is often referred to as gaze. Although the mean gaze on food items for Restrainers per unit area was less than that of Nonrestrainer fasters (Table 13), the ANOVA did not indicate significance in any of the factors (Table 14), except, again, for Content. The nonsignificant trend noted was actually the reverse of that hypothesized; rather than Restrainers looking at food items more, they spent less time viewing food items than did Nonrestrainers. In fact, the Fasting Restrainer group had the lowest mean gaze for food items

Table 13

Mean (and Standard Deviation) Gaze Per Unit Area: Fasting by Restraint by Content

		NonRestrainer		Restrainer		Total
		Fast	Milk	Fast	Milk	
Body	$\bar{x}$	211.29	195.49	226.94	247.40	220.28
	sd	84.87	89.71	119.77	132.44	
Food	$\bar{x}$	622.37	511.66	459.57	506.53	525.03
	sd	254.33	355.67	251.77	270.33	
Total		416.83	353.58	343.26	376.97	

Note. Values are given in milliseconds per unit area.

Table 14

ANOVA Summary of Gaze per Unit Area: Fasting by Restraint by Content

Source	df	Mean Square	F	Significance
Fasting	1	38889.492	.378	> .500
Restraint	1	68550.188	.666	.418
Fast X Res	1	129235.188	1.256	.268
Subjects	56	102906.125	Not Tested	
Content	1	9205875.000	109.056	< .001
Fast X Content	1	44096.879	.522	.473
Res X Content	1	199659.688	2.365	.130
Fast X Res X Content	1	67695.688	.802	.375
Content X Subjects	56	84414.500	Not Tested	
Total	119	170117.063		

than did any other group. Despite nonsignificance, means were in the direction expected for Nonrestrainer-fasters who gazed at food items more than Nonrestrainers whose appetites were satiated by the milkshake. Mean score differences between the Restrainer and Nonrestrainer groups were less in the milkshake versus nonmilkshake comparison. Gaze values per unit area were consistent with results found when the ANOVA was rerun using gaze per information density data (Table 15). Although Restrainers' mean gaze on body image items was higher than Nonrestrainers mean gaze, there were no significant differences between the groups' gaze scores on this variable (Table 16). As in previous analyses, body image means were significantly greater than food item means.

Mean Duration. The mean duration measurement indicates the total amount of time spent on items of critical content divided by the number of fixations comprising that time. In this analysis, time

Table 15

ANOVA Summary of Gaze (in milliseconds) per Information Density:

Fasting by Restraint by Content

Source	df	Mean Square	F	Significance
Fasting	1	62030.859	.065	> .500
Restraint	1	13977.629	.015	> .500
Fast X Res	1	2.859	Very Small	
Subjects	56	949019.375	Not Tested	
Content	1	8839890.000	15.450	< .001
Fast X Content	1	1023330.938	1.789	.187
Res X Content	1	1051371.000	1.838	.181
Fast X Res X Content	1	252402.500	.441	> .500
Content X Subjects	56	572152.250	Not Tested	
Total	119	810324.125		

Table 16

Mean (and Standard Deviation) Gaze Per Information Density:

Restraint by Fasting by Content

		NonRestrainer		Restrainer		Total
		Fast	Milk	Fast	Milk	
Body	$\bar{x}$	1495.68	1726.32	1795.89	1843.69	1715.40
	sd	949.30	817.08	1117.87	1285.95	
Food	$\bar{x}$	1416.48	1094.28	1158.82	1020.69	1172.57
	sd	643.22	785.94	500.43	610.31	
Total		1456.08	1410.30	1477.36	1432.20	

Note. Values are given in milliseconds per unit information density.

spent looking on areas other than those containing food or body-image content was included as Noncritical fixation time. This resulted in a Fasting X Restraint X Content X Critical ANOVA with the first two factors between subject measures, the last two factors within subject measures (Table 17). The significant Content effect indicates that

Table 17

ANOVA Summary of Mean Duration: Fasting by Restraint by Content: by Critical and Noncritical Regions

Source	df	Mean Square	F	Significance
Fasting	1	9367.309	.219	> .500
Restraint	1	1946.695	.045	> .500
Fast X Restraint	1	187.900	.004	> .500
Subjects	56	42860.785	Not Tested	
Critical	1	240036.000	28.051	< .001
Fast X Crit	1	192.648	.023	> .500
Res X Crit	1	3099.083	.362	> .500
Fast X Res X Crit	1	313.216	.037	> .500
Crit X Subjects	56	8556.871	Not Tested	
Content	1	231372.500	23.178	< .001
Fast X Content	1	15692.004	1.572	.216
Res X Content	1	1292.192	.129	> .500
Fast X Res X Content	1	12595.449	1.262	.267
Content X Subjects	56	9982.500	Not Tested	
Crit X Content	1	346402.688	32.935	< .001
Fast X Crit X Cont	1	11617.887	1.105	.298
Res X Crit X Cont	1	4392.711	.418	> .500
Fast X Res X Crit X Cont	1	19924.137	1.894	.175
Crit X Cont X Sub	56	10517.844	Not Tested	
Total	239	20610.844		

mean duration on food items was significantly longer than that on body image items. The significant Critical effect and the Critical by Content interaction show that food items were viewed significantly longer than noncritical items but there was no difference in duration between body image items and noncritical areas. Again, main effects and the interactions relating to the hypotheses were not significant. Despite nonsignificance, the mean scores followed patterns similar to those found in the previous analysis (Table 18). That is,

Table 18

Mean (and Standard Deviation) Durations: Fasting by Restraint by Content by Critical/Noncritical

		Nonrestrainer		Restrainer		Total
		Fast	Milk	Fast	Milk	
Body Crit	$\bar{x}$	338.24	386.23	370.75	354.35	362.39
	sd	106.93	139.46	149.26	130.34	
Noncrit	$\bar{x}$	380.40	372.28	378.30	369.53	375.13
	sd	74.25	93.39	105.21	53.98	
Food Crit	$\bar{x}$	552.32	474.71	493.00	481.86	500.47
	sd	218.61	199.76	187.97	174.05	
NonCrit	$\bar{x}$	361.12	355.95	374.32	353.57	361.24
	sd	84.75	69.48	125.56	90.57	
Total		408.02	397.29	404.09	389.83	

Note. Measurements are in milliseconds.

Nonrestrainer fasters spent more time per fixation viewing food items than did either of the Milkshake groups or than the Restrainer faster group. The Nonrestraint milkshake group showed the longest duration to body image cues; however this was not at a significant level.

Number and duration of fixations until fixation to a critical region. When viewing a picture, the tendency is to attend quickly to items that contain the greatest amount of information or interest to the individual. Therefore, it was thought to be of value to compare the number of fixations that occurred and the amount of time elapsed during the 20 second viewing period before a subject viewed a food or body image item. According to the hypothesis, it was expected that Restrainers and Fasters would take fewer fixations and a lesser amount of time (duration) before fixating on a critical item. The Fasting X Restraint X Content ANOVA results which took into account the number of fixations occurring before subjects looked at food or body image items are presented in Table 19 and the means are given in Table 20. Results of the Fasting X Restraint X Content ANOVA assessing elapsed time before fixation on critical items are found in Table 21 (means are presented in Table 22). None of the main effects or interactions hypothesized were significant; however, a main effect for Content was significant. Subjects attended to food items sooner than body image items. It is interesting to note the similarities in the means between the Restrainers who where given the milkshake and the Nonrestrainers who were in the fasting condition (Table 22). These subjects took the least amount of time and fixations to attend

Table 19

ANOVA Summary of Number of Fixations Until First Fixations on Critical Regions: Fasting by Restraint by Content

Source	df	Mean Square	F	Significance
Fasting	1	6.226	.185	> .500
Restraint	1	53.334	1.585	.214
Fast X Rest	1	73.633	2.188	.214
Subjects	56	33.655	Not Tested	
Content	1	1060.092	42.693	< .001
Fast X Content	1	2.133	.086	> .500
Res X Content	1	52.448	2.112	.152
Fast X Rest X Cont	1	1.793	.072	> .500
Content X Subjects	56	24.831	Not Tested	
Total	119	38.024		

Table 20

Mean (and Standard Deviation) Number of Fixations Until First Fixation On A Critical Region

		Nonrestrainer		Restrainer		Total
		Fast	Milk	Fast	Milk	
Body	$\bar{x}$	15.04	16.56	13.71	12.58	11.72
	sd	6.51	7.53	5.43	4.78	
Food	$\bar{x}$	7.27	9.80	9.07	7.98	8.53
	sd	3.35	5.93	4.34	4.16	
Total		11.16	13.18	11.38	10.28	

Table 21

ANOVA Summary of Duration Until First Fixation on Critical Regions: Fasting by Restraint by Content

Source	df	Mean Square	F	Significance
Fast	1	200089.688	.037	> .500
Rest	1	3698415.000	.690	.410
Fast X Res	1	4053860.000	.757	.389
Subjects	56	5358011.000	Not Tested	
Content	1	141319552.000	41.667	< .001
Fast X Content	1	89539.063	.026	> .500
Res X Content	1	7679002.000	2.264	.139
Fast X Res X Cont	1	1905769.000	.562	.457
Cont X Subjects	56	3391671.000	Not Tested	
Total	119	5453172.000		

Table 22

Mean (and Standard Deviation) Duration of Fixations Until First Fixation On A Critical Region

		Nonrestrainer		Restrainer		Total
		Fast	Milk	Fast	Milk	
Body	$\bar{x}$	5279.73	5368.26	4538.24	4395.64	4895.47
	sd	3209.30	2509.35	1976.30	1869.90	
Food	$\bar{x}$	2405.97	2889.32	3180.44	2424.50	2725.06
	sd	1314.23	1443.61	2219.01	1504.88	
Total		3842.85	4128.79	3859.34	3410.07	

Note. Values are given in milliseconds.

to food items. Thus although the mean scores are in the direction expected for the fasting Nonrestrainer group, an apparently paradoxical effect was seen for the Restrainer group.

Mean interfixation distance. Longer interfixation distances to food items were expected for the Fasting and Restrainer groups, as this is an indication of additional attention directed towards the critical items which are hypothesized to hold a high level of interest for these groups. Table 23 shows the results of a Restraint X Fasting X Content X Critical/Noncritical Region ANOVA with mean interfixation distances to critical versus noncritical regions as the dependent variable. A Critical X Content interaction was the only significant result ($p < .002$). Mean interfixation distances were longer for critical body regions than for critical food regions. The reverse was true of noncritical regions; interfixation distances were longer to the noncritical regions of food slides than to noncritical regions of body-image slides. Although none of the effects of interest were significant some trends emerged. A main effect for Fasting approached significance ($p < .09$), with smaller interfixation distances for fasters than nonfasters. This outcome is the opposite of that expected. Additionally, a near-significant three way interaction effect for Restraint X Critical Region X Content was notable ($p < .09$). The trend suggested that Restrainers had large interfixation distances to critical body image regions and very short distances to critical food regions in comparison to Nonrestrainers. The interfixation distance data were also somewhat supportive of

Table 23

ANOVA Summary for Mean Interfixation Distance:

Fasting by Restraint by Content by Critical and NonCritical Regions

Source	df	Mean Squares	F	Significance
Fasting	1	6.727	2.995	.090
Restraint	1	.315	.140	> .500
Fast X Rest	1	.923	.411	> .500
Subjects	56	2.246	Not Tested	
Critical	1	.434	.427	> .500
Fast X Crit	1	.007	.007	> .500
Res X Crit	1	.013	.012	> .500
Crit X Subjects	56	1.015	Not Tested	
Content	1	1.216	1.471	.231
Fast X Content	1	.408	.494	.485
Res X Content	1	1.420	1.718	.196
Fast X Res X Content	1	.371	.449	> .500
Content X Subjects	56	.826	Not Tested	
Crit X Content	1	9.988	11.401	.002
Fast X Crit X Content	1	.008	.009	> .500
Res X Crit X Content	1	2.600	2.968	.091
Fast X Res X Crit X Content	1	.637	.727	.398
Crit X Content X Sub	56	.876	Not Tested	
Total	239	1.274		

Nonrestrainers' attention being drawn to food items to a greater extent and to body images to a lesser extent than Restrainers. However differences between the groups were negligible across noncritical food and body image regions. Therefore, the evidence was somewhat supportive of Restrainers utilizing greater effort to view body image items but not food items, and in fact Nonrestrainers

exceeded Restrainers in their efforts to view food items. Table 24 gives the mean interfixation distances for each of the experimental groups. The Nonrestrainer milkshake group evidenced the greatest mean interfixation distances to food cues ($x = 5.32$), and the shortest distance was present in the Restrainer milkshake group ($x = 4.49$).

Table 24

Mean (and Standard Deviation) Interfixation Distance: Restraint by Fasting by Content by Critical and NonCritical Regions

		Nonrestrainer		Restrainer		Total
		Fast	Milk	Fast	Milk	
Body						
Crit	$\bar{x}$	4.87	5.61	5.46	5.62	5.39
	sd	1.24	1.42	.89	1.84	
NonCrit	$\bar{x}$	4.78	5.41	4.82	5.12	5.03
	sd	.81	1.40	1.02	.94	
Food						
Crit	$\bar{x}$	4.74	5.32	4.57	4.49	4.78
	sd	1.05	1.97	1.76	.87	
NonCrit	$\bar{x}$	5.30	5.36	5.06	5.60	5.33
	sd	.64	.72	1.08	1.09	
Total		4.92	5.43	4.98	5.21	

Note. Values are given in degrees of visual angle.

Mean pupil size. No specific predictions were made at the outset concerning pupil size comparisons. Larger pupil sizes during picture viewing are thought to indicate greater mental effort (Kahneman, 1973). Tables 25 and 26 summarize the findings. The ANOVA revealed a main effect for Fasting ($p < .034$), indicating fasting

subjects had significantly smaller pupil measurements for both food and body image items than the milkshake groups. Significant main effects and a two way interaction were also found for Critical Area ($p < .002$), Content ($p < .001$), and Critical Area X Content ($p < .001$). Subjects' pupil sizes were larger when viewing body image regions in

Table 25

ANOVA Summary of Mean Pupil Size on Critical and Noncritical Regions: Fasting by Restraint by Content

Source	df	Mean Square	F	Significance
Fasting	1	2319.675	4.731	.034
Restraint	1	91.121	.186	> .500
Fast X Res	1	1139.961	2.325	.133
Subjects	56	490.290	Not Tested	
Crit	1	31.596	11.73	.002
Fast X Crit	1	1.444	.536	.468
Res X Crit	1	1.666	.619	.435
Fast X Res X Crit	1	.002	Very Small	
Crit X Subjects	56	2.694	Not Tested	
Content	1	482.007	83.657	< .001
Fast X Content	1	.532	.092	> .500
Res X Content	1	11.129	1.931	.171
Fast X Res X Cont	1	9.882	1.715	.196
Content X Subjects	56	5.762	Not Tested	
Crit X Content	1	115.594	38.426	< .001
Fast X Crit X Cont	1	.706	.235	> .500
Res X Crit X Cont	1	.874	.290	> .500
Fast X Res X Crit X Cont	1	10.292	3.421	.070
Crit X Cont X Sub	56	3.008	Not Tested	
Total	239	135.208		

Table 26

Mean (and Standard Deviation) Pupil Size: Fasting by Restraint by Content by Critical/Noncritical

		NonRestrainer		Restrainer		Total
		Fast	Milk	Fast	Milk	
Body						
Crit	$\bar{x}$	4.51	5.11	4.82	4.98	4.86
	sd	.71	.82	.76	.52	
NonCrit	$\bar{x}$	4.41	5.09	4.80	4.94	4.81
	sd	.70	.80	.74	.54	
Food						
Crit	$\bar{x}$	4.21	4.92	4.58	4.64	4.59
	sd	.67	.82	.74	.53	
NonCrit	$\bar{x}$	4.36	5.02	4.78	4.80	4.74
	sd	.66	.84	.75	.51	
Total		4.37	5.04	4.75	4.84	

Note: Measurements are in millimeters.

comparison to food regions. Whether the picture being viewed contained body or food cues made a difference for critical regions but not for noncritical regions. The interaction thus revealed that subjects viewing critical items evidenced larger pupil sizes on body image regions but not food regions in comparison to noncritical items. In summary, pupil size analyses suggested that subjects overall put forth greater mental effort on critical body image regions than critical food items.

CHAPTER V: DISCUSSION

The present study examined whether food deprivation and satiety in Restrained and Nonrestrained eaters would differentially affect picture viewing patterns. Predictions were guided by literature from three areas of research which have not previously been incorporated together, namely, food deprivation, restraint, and eye movement measurement. The major findings from these somewhat disparate areas which led to the design and hypothesis of this study were five-fold. First of all, individuals deprived of food have been found to show an increase in food-related cognitions and behaviors. Secondly, restrained eaters, similar to subjects with clinical eating disorders, acknowledge persistent preoccupations with dieting and weight loss. Thirdly, according to the Boundary Model, when restrained eaters experience a breach in their self-imposed diet boundary (disinhibition) they tend to abandon all restraint and eat until satiety is reached. Fourthly, restrained individuals' primary motivation for continual dieting is the attainment of an overidealized slim body shape. Finally, eye movements have been found to be a valid, unobtrusive, means of demonstrating between- and within-subject differences in attention to pictorial stimuli based upon prior learning experiences and cognitive sets.

The hypotheses of this study included expectations that eye movement data would show differences between groups in the relative saliency of food and body image items within pictures. One

between-group difference expected was that the Fasting group would spend more time and effort looking at food items in pictures then the satiated Milkshake group. Furthermore, it was predicted that the Restrainer group would show more interest in food items within pictures than the nonrestrainer group. Finally, it was proposed that Restrainers would display greater evidence of attention toward female body images than would Nonrestrainers.

Summary of Fasting Group Findings

Sanford (1936) and Levine et al (1942) found some support for their hypothesis that drive states, such as hunger, motivate and influence perceptions and attention. The present study hypothesized that fasting individuals would find food items more salient. Although significant results were not obtained in support of this, a trend in higher mean fixation frequencies, duration and gaze on food regions in the Nonrestrainer-fasting group was noted.

Summary of Restraint Group Findings

Differences in eye movement measurements of attention have recently been found between subclinical groups of depressives and normals when viewing pictures which depicted sad and happy emotional themes (Matthews, 1988). Thus it was expected that different attention reactions to visual presentations of food and body images could be found among a selection of the population that has consistently acknowledged higher levels of preoccupation with food and weight. However, the analyses of interest failed to find significant evidence of a cognitive set among Restrainers which would result in

biased perceptual selectivity and processing strategies. Restrainers did not indicate preferential viewing of food or body image regions as measured by fixations, gaze, duration, interfixation distances or first fixations.

Explanation of Findings

It is always conceivable that had tighter controls over subject characteristics, experimental design or experiment stimuli been achieved significant results might have occurred. However an equally likely explanation may be that no differences were found because none exist. Erdelyi (1974) suggested that a particular cognitive set can result from laboratory interventions or from individual predispositions. The following discussion will attempt to clarify subject and experimental variables which may have impacted subjects' cognitive sets and thereby the results obtained in this study. The reader is encouraged to bear in mind that any explanations asserted as possible confounds are done so *a posteriori* and as such should be considered tentative.

Assessment of Hunger Manipulation

Physiological vs. psychological perceptions in Restrainers.

Boundary Model theory (Herman & Polivey, 1984) proposed that biological forces have the largest control over food consumption when individuals are physiologically hungry or satiated. However, between these aversive extremes lies a zone where "biological indifference" prevails. It is within this range of hunger perception where psychological factors have their greatest impact on caloric

consumption. Restrained eaters are hypothesized by his model to have a wider zone of biological indifference than normal eaters. Restrainers have a lower boundary for hunger and a higher boundary for satiety. As such, greater than average extremes for both food deprivation and stomach fullness must be reached before Restrainers will experience hunger or satiety.

Similar to Kirschenbaum and Tomarken (1982), no differences were found between groups in their rating of level of hunger in the current study. However, there was a trend toward Restrainers underreporting perceptions of hunger. The Nonrestrainer group admitted to a 'strong desire to eat' more often than the Restrainer group. This was despite the fact that both groups reported a similar time elapsing since last eating (5.6 hours for Nonrestrainers, 5.9 hours for Restrainers). The number of subjects who reported having exercised that day (10 Nonrestrainers, 11 Restrainers) likewise was congruent. Although the amount of food eaten prior to the fasting period was not controlled, the majority of subjects reported eating a medium sized meal around noon. Thus some mild support for Restrainers requiring greater deprivation before experiencing hunger when compared to normal eaters was suggested by the data obtained.

A further explanation for why Restrainers may underreport hunger perceptions may be due to their pattern of food consumption. Prior to Herman and Polivy's model, Sanford (1936) theorized sources of the need for food stemmed from 1) the food habit and 2) the physical need for food. Food habit refers to "a periodic activity of digestive

mechanisms." (p. 156) These physiological actions which prepare for the digestion of food become conditioned by a person's routine eating schedule (e.g., three meals a day). He further argued that a fading of the food habit occurs when the taking of food at regular intervals is absent. On the other hand, the physical need for food refers to a state of depletion in bodily tissues and is considered the most essential factor which would lead someone to seek out food. He suggested that the physical need generally appears 6-8 hours after food is eaten and increases directly with time thereafter. However, when these two factors alone were insufficient in accounting for all of the variance observed by Fasting and Nonfasting subjects in their number of food responses, two additional factors were hypothesized, varying levels of energy expenditure or metabolic rate and "suppression". Each of these factors warrant further investigation as explanations for the results in the present study.

Restrainers typically eat sporadically. As a result, it is possible that they may have only a weakly conditioned "food habit" and may not have felt as strong a need for food near the lunch hour as nonrestrained eaters who are more regular in their food consumption. A criticism leveled by Rodin (1981) against the Boundary Model is its purely descriptive function with no explanation for why differences in hunger and satiety boundaries emerge among eating disordered, restrained and normal eating individuals. Sanford's conditioned "food habit" may help explain why Restrainers' hunger [illegible] is assumed to be lower than normal eaters. Some anecdotal evidence for this was

found in the present study. Numerous Restrainers indicated they ate breakfast at the noon time meal. When asked to indicate usual dinner times, one Restrainer replied she never ate dinner.

Food deprivation manipulation. Although some rudimentary controls over the degree of physiological deprivation were attempted it is very likely that this factor was not consistent between individuals and across groups. Metabolic rates were assumed to be similar between Restrainers and Nonrestrainers and no measurements of this variable were taken. Furthermore, energy intake and expenditure were not monitored. Given the Boundary Models' assumption that Restrainers require greater extremes of deprivation before reporting a hunger drive it is possible that the period of fasting used in the present study was insufficient to produce this drive state and may be a primary reason for lack of strong differences being found. Although a number of subjects (10) indicated a strong desire to eat, the majority of subjects (33) indicated only a moderate desire to eat, and a substantial number indicated only a minimal or no desire to eat (14 and 3, respectively). These results suggest to future researchers that it is imperative to control for caloric intake and fasting periods prior to measuring food preoccupation.

Working from the Boundary Model of restraint, it is hypothesized that once Restrainers have broken through their resolve not to overeat or not to eat "taboo" foods, they abandon all caution and restraint. One would thus expect food cues to have additional saliency for those who tend to "counterregulate". Perceptual vigilance towards food cues

for Restrainers who were forced to break their fast by drinking a milkshake was therefore predicted in the present study. However, Restrainers who were fasting and Restrainers who had been given the milkshake did not show much variance across eye movement measures. There was even less support for the hypothesis that Restrainers would spend more time viewing body-image items, with no particular trends noted across dependent variables.

Fasting Restrainers did not show a tendency toward viewing food regions as was noted in Fasting Nonrestrainers. In fact, Fasting Restrainers' eye movement data were more similar to the Nonrestrainer Milkshake group who spent nonsignificantly less time viewing food items. Perhaps Nonrestrainers do not guard against food cues when hungry whereas Restrainers suppress the tendency of cognitive processes to move in the direction of drive-satisfaction. Rather than being aroused and vigilant toward food cues, as was noted in the normal semi-starved subjects of Keys et al., it makes more sense to hypothesize that Restrainers actively suppress or ignore hunger and food cues to maintain successful dieting. Once satiated or off their diet they should no longer need to suppress these thoughts and perceptions. The clinical literature is replete with descriptions of anorexic and even normal or obese dieters whose cognitions deceive them so that they do not feel hungry. Such deceit would allow them to maintain a dieting stance more readily. Perhaps resolving to maintain a dieting stance despite hunger prepares an individual to avoid food cues, despite level of hunger, and to fight against a

natural inclination demonstrated by normal eaters. Anecdotal evidence of suppression was given by a Restrainer subject who made the comment "I don't want you to think I'm hungry" while viewing a food slide. Thus the mix of paradoxical suppression among some Restrainers and even Nonrestrainers and lack of suppression among others may have cancelled out any main effects of restraint or fasting.

Perceptual Defense and Vigilance

The hypothesis that there are significant differences between Restrainers and normals in how they process food cues was not supported by the present study. Further explanation as to why significant results were not obtained may be found by examining Erdelyi's work. According to Erdelyi (1974), the meaning of stimuli, including their affective tone, substantially determines the fixation strategy of the observer. There are two processes which are thought to impact significantly on individuals' eye movement measurements. During one process receivers demonstrate an enhancement effect, referred to as vigilance, where the threshold for perception and encoding of certain stimuli is lowered. As a result of vigilance, the eye tends to fixate more on the desired stimuli. Another process, perceptual defense, works to avoid or defend against stimuli. The result of defense mechanisms is to raise the threshold for perception and encoding of negative stimuli. Negative stimuli are actively prevented from perception by directing the fovea of the eye away from the stimulus.

The theoretical constructs of perceptual defense and vigilance are of interest in the present study due to the paradoxical trend noted between mean scores of the Restrainer and Nonrestrainer Fasting groups across eye movement measurements. When viewing food slides, the Restrainer group means for percent and number of fixations, duration, gaze, and time and duration until first fixation on a critical food item were more similar to the Nonrestrainer Milkshake group than the Nonrestrainer Fasting group. A suppression effect, similar to perceptual defense, among Restrainers toward food cues is hypothesized to account for these mean differences. Some support for this explanation can be found in the recent study by Matthews (1988) which found that depressed subjects fixated sad regions of pictures significantly more often than did nondepressed subjects and fixated happy regions significantly less. Results were suggested as supporting a visual attentional defense mechanism which works less effectively for depressed than nondepressed subjects to avoid depressing themes (Matthews & Antes, 1990). Similarly, in a subgroup of restrainers, a visual attentional defense mechanism may work effectively to avoid food cues which might lead them to break their dietary restraint. Thus, the Nonrestrainer Milkshake subjects were more likely to show less interest in food items because of satiety, whereas the Restrainer subjects showed less interest in food items as an aid to suppression of hunger stimulation. The Nonrestrainer Fasting subjects, as hypothesized, were not compelled to defend

against food cues and therefore viewed the food items with heightened interest.

Restraint: Heterogeniety as a result of problem's with definition and measurement

Several researchers have made the argument that some of the inconsistencies in results reported in the restraint literature reflected problems in sampling (Rodin 1981; Ruderman, 1986). The two most recognized problems are inclusion of a higher proportion of overweight subjects as Restrainers and the use of varying scores on the Revised Restraint Scale for restraint subject identification. Ruderman concluded that reported differences may have been based on the problem of overinclusion of overweight subjects as Restrainers when using scores obtained from the Revised Restraint Scale for selection criteria. This is of concern as research using obese Restrainers and Nonrestrainers has produced equivocal results. This shortcoming prompted others to restrict samples to normal weight restrictors. Although there is currently another measure of restraint available which reportedly lessens the likelihood of a body weight confound (Stunkart & Messick, 1985), at least one study has found a high correlation between the Revised Restraint Scale and this measure (Wagner, 1989). Although overincluding overweight subjects on the basis of their acknowledging greater weight fluctuations is a valid concern, little difference is likely to result in the mean weight of the restraint subject group as a result of using one versus the other measure for subject selection. There also is disagreement in the

literature as to the optimal cut-off criteria to use with Revised Restraint Scale scores to prevent Type I and II errors when defining Restrainer and Nonrestrainer groups. Some researchers continue to rely on median splits to divide sample groups while others use upper and lower ranges based on their sample population.

Differentiating restrainers by weight. The design of the present study included several measures which were meant to ensure a more homogeneous selection of subjects within each experimental group. Only subjects who were within the average weight range for their height according to self-report data, and who scored at least one standard deviation above or below the mean restraint score were selected to participate in the experiment. To assure that self-report data were accurate, height and weight measurements were taken at the time of the experiment. Nonetheless, a significant weight difference between Restrainer and Nonrestrainer groups still occurred.

The primary reason that the Restrainer group weighed more is that several Restrainers who were 1-3 pounds over average for their size were retained in order to obtain a large enough Restrainer sample. Whereas ample control subjects within an average weight range were available to choose from, few Restrainers were at or below an average weight range. Similarly, Ruderman and Wilson (1979) had considerable difficulty locating nonrestrained subjects who were overweight. It is unclear from the present study whether subjects in higher weight ranges met criteria for the restraint group due to higher scores on the Weight Fluctuation factor of the Revised

Restraint Scale or due to their acknowledgment of behaviors which typify Restrainer subjects (i.e. concern with dieting, counterregulation of food intake). It seems plausible to suggest that a higher proportion of overweight subjects are going to be dieting and thus likely experiencing many of the cognitive and behavioral correlates of restraint.

Observations made of subjects' behavior and comments suggested that both Restrainer and Nonrestrainer females were averse to having their weight measurements taken. A number of subjects went to great lengths to try and reduce the amount of clothing they had on to decrease their weight even slightly (i.e. taking off shoes, sweaters, jewelry). Numerous subjects responded with "oh, no!" when told what the scale said they weighed. Perhaps the phenomenon of heightened weight concern within restraint populations is applicable to some degree to the larger population of young college women, resulting in more similarities than differences between groups.

The majority of studies in the past have identified Restrainers by administering the Revised Restraint Scale directly following experimental procedures. The present study used the Revised Restraint Scale for subject selection several weeks prior to the experimental procedures. Thus it is conceivable that a certain number of individuals' scores may have changed over that time period. Although test-retest reliability figures (Kickham & Gayton, 1977) suggest that this is not a significant concern, Hibscher and Herman (1977) found 14% of their subjects changed restraint classification upon retesting.

The results presented here suggest that more evidence is needed to determine whether overweight Restrainers should be considered a subgroup of Restrainers. It may be that cognitive and behavioral differences between weight groups are negligible. Future research which includes multiple measures of restraint may help determine whether excluding overweight subjects is prudent. Results also reiterate the need for follow-up measurements of height and weight to self-report measurements due to the tendency, particularly among Restrainers, to underreport. Restraint scores should also be obtained following experimental manipulation if some time elapses between subject selection and experimentation to rule out this sampling confound.

Differentiating restrainers from other weight control groups. Although the overidentification of obese individuals as restraint subjects was diminished in the current study, other eating disordered groups (i.e. anorexics and bulimics) were likely not differentiated by the selection criteria (Revised Restraint Scale score). Bulimic and anorexic subjects have been shown to score high on the Revised Restraint Scale (Ruderman, 1985; Stein & Brinza, 1989), particularly with regard to questions comprising the Concern with Dieting factor. Restrained eaters have also been shown to evidence symptoms in common with eating disordered individuals (Brinza, 1987; Wagner, 1989).

The lack of clear identity for restrained eaters is notable in their being variously referred to as chronic dieters, binge-eaters, and/or weight preoccupied. According to Ruderman (1986) there are two

core assumptions concerning restrained eaters, 1) that restrained eaters develop abnormal eating patterns characterized by dieting and sporadic overindulgence and 2) the self-control of restrained eaters may be temporarily interfered with by certain events called 'disinhibitors' which cause their physiological need for food to overcome them and result in consumption of large quantities of food. However, the above criteria could also be said of bulimics as well as anorexics who occasionally binge-eat.

A notable absence in the literature is a clarification of how restrained eaters are sufficiently different from eating disordered individuals other than their exhibiting a subclinical or mild level of eating disorder symptoms (e.g., Fries, 1974; Vandereycken & Meerman, 1984). However some eating disorder researchers have found weight-preoccupied and/or binge-eater groups of women to differ significantly from anorexic and bulimic groups (e.g., Garner, Olmsted & Garfinkel, 1983; Katzman & Wolchik, 1984). Polivy (1984) also suggested that eating disorder populations differ from milder restrained eaters in where they place their diet boundary and what their reactions will be once their diet boundary is transgressed.

The theorizing and preliminary results reported in the literature suggest that researchers working with restraint populations should attempt further to differentiate high scorers on the Restraint Scale who may represent clinical levels of an eating disorder. Yet no one to date has done so. The results of previous studies are clearly suggestive that the present sample of Restrainers was comprised of

different types of dietary Restrainers. Vandereycken and Meerman (1984) warn of the danger of the "uniformity myth" in diagnostic classifications. The apparent heterogeniety of weight-preoccupied women illustrates that the focus on a single symptom (e.g. weight preoccupation), or the restricted study of eating behavior (e.g. laboratory counterregulation studies) may obscure meaningful ideographic or subgroup differences. Few studies to date, have compared "restrained" individuals with clinical groups of bulimic or anorexic individuals. This lack of clarity makes it difficult to formulate hypotheses regarding Restrainer characteristics when the design of the study is not directly linked to measurement of disinhibition and counterregulation of food consumption.

Affective Differences Between Restrainers and Nonrestrainers

As noted in the literature review, researchers have long suggested that emotions and eating are related (e.g., Bruch, 1973; Schachter, 1971). The general hypothesis is that normal individuals generally will eat less and obese people overeat when anxious; however experimental results have been equivocal. Hypotheses generated as tests of the Boundary Model (Herman & Polivy, 1984) usually predict that a strong affect will lead to evidence of disinhibition in restrained eaters. Studies which have examined the influence of anxiety level on food consumption of restrained and unrestrained eaters have presented conflicting results (e.g. Herman & Polivy ,1975; Herman, Polivy, Lank and Heatherton, 1987). Research has suggested that Restrainers find drinking the milkshake preload an anxiety

producing activity due to their concern over violating their diet. In the current study, it was therefore expected that Restrainers who had been given the milkshake would acknowledge higher levels of anxiety than Fasting Restrainers. Although mean anxiety levels were in the direction expected, analyses revealed that Restrainers who had been given the milkshake were not significantly more anxious than Fasting Restrainers. Perhaps the anticipation of possibly having to drink a milkshake raised the Fasting Restrainers' anxiety level to that roughly equivalent to the Restrainer Milkshake level. Although results have not been highly consistent, prior research has suggested that in some circumstances even anticipation of dietary violations is sufficient to induce overeating in restrained eaters (Ruderman, 1986).

An unexpected finding was that relative to Nonrestrainers, the Restrainer group acknowledged a significantly higher level of anxiety. Higher anxiety scores by Restrainer subjects appears to support the claim of hyperresponsiveness and hyperemotionality in chronic dieters. While several studies reported in the literature found differences between Restrainers and Nonrestrainers in their food consumption levels and rating of slides following an experimental anxiety manipulation, there are few studies reported which administered anxiety measures to Restrainers and Nonrestrainers prior to experimental manipulation. What evidence is available for comparison has not shown significant differences in anxiety scores between Restrainer and Nonrestrainer groups. For instance, a dissertation study by Wagner (1989) found no differences between Restrainers and

Nonrestrainers on MAACL-R pretest scores although scores did change as a result of the anxiety producing experimental manipulation. Similarly, there were no significant differences in male subjects involving the variable of restraint on any of the anxiety questionnaires administered post hoc in Polivy, Herman and Warsh's (1978) experiment. Reasons for higher levels of anxiety in Restrainers in the present study are unclear. Perhaps the perception that dietary habits were being examined or the lack of control and certainty with what was expected produced higher levels of anxiousness in these subjects who are used to exercising a considerable amount of control over food in their life. It is interesting to note that one Restrainer refused to drink the milkshake stating she had already had an ice-cream cone that day and didn't want to consume more calories.

Although more evidence is needed, the fact that Restrainers scored higher on the state anxiety measure suggests that Restrainers may also experience an enduring trait of higher anxiety levels. The externality or hyperemotionality ascribed to the obese and Restrainers by some in the literature needs to be examined more fully in terms of specific situations which may cause an elevation of anxiety in Restrainers. Uncertainty still exists in the literature as to whether the hyperresponsiveness found in previous studies with the obese and dieters is a reflection of higher levels of anxiety in general or confined to eating situations. Appetitive behavior and mood regulation appear to share some common neurochemical systems such as the monoamines (Kaye, 1985). Eating disordered individuals have been

shown to exhibit higher levels of depression (Pope et al., 1983; Walsh et al., 1982). Some of these individuals' eating disorder symptoms have been responsive to anti-depressant medication. Further research into mood states and food intake may lead to improved understanding and treatment of eating disorders.

Pupil Diameter, Arousal and Effort

No predictions regarding pupil diameter differences between groups were made at the outset of the study. The main reasons for this uncertainty were twofold. First, although it has been well established that pupil diameter measures mental effort and arousal, many factors can influence the arousal level of subjects. As Kahneman (1973) has noted, a major drawback in using physiological techniques such as pupil diameter measurements to measure effort is the high range of uncertainty as to whether the physiological response being measured is due to the task demands or to other sources of stimulation such as subjects' emotional state. Kahneman argues though that the evidence to date suggests that sources of arousal other than that due to mental effort play a relatively small role in arousal variations that occur during pupil measurement. A second reason for the lack of an *a priori* hypothesis is that pupil measurements have been useful in showing within-task and between-task variations but have not been widely used to demonstrate between subject differences.

It may be speculated that because the Restrainer group indicated an elevated anxiety score in comparison to the Nonrestrainer group that their pupil size would be larger. Results were not supportive of

this assumption. However, Fasting subjects were found to have significantly smaller mean pupil diameter measurements than Nonfasting subjects. This suggests that Fasting subjects put forth less mental effort than Nonfasting subjects during picture viewing. A plausible explanation for this finding is that the fasting requirement left subjects with less energy or ability to concentrate during the picture viewing task.

Pupil diameter measurements further indicated larger pupil diameters by subjects when they viewed body image regions. This observed difference is likely the result of variations in the darkness of hues in the colored slides. Females in the pictures generally wore dark clothing. The pupillary response to less light is to enlarge. Since the female body regions were darker, this likely resulted in greater pupil aperture.

The picture viewing task. The nonsignificant trend of Nonrestrainer fasters evidencing the highest mean scores on dependent variables (i.e., percent fixations, gaze, duration and lowest mean scores for number of fixations and duration until first fixation on a critical region) when viewing food items lends some support to Sanford's (1936) and Levine, Chein and Murphy's (1942) hypothesis that drive states motivate and influence perceptions and attention. However, the type of stimuli and measurement used varied substantially from the present study in comparison with these earlier experiments, which may explain why stronger results where not obtained presently. Sanford (1936) used five different tasks with ambiguous pictures;

Levine et al., used a within and between subject picture identification design with simple, occluded pictures of food and non food items. In addition, Levine et al. included a suggestion to the experimental group that they would be fed after the picture identification tasks. On the other hand, pictures which subjects viewed in the present study were unambiguous and a word or picture identification procedure was not used.

Pictures in the present study were more similar to those used in a picture recall study with Restrainers by Kotschwar (1988) who also found no significant differences between Restrainers and Nonrestrainers. The lack of ambiguity in the pictures and tasks used may have several implications. First, as hypothesized by Kotschwar, the use of unambiguous pictures may have made it impossible for food and body-image items not to be salient, thus creating a ceiling effect which prevented a distinction between groups. Perhaps more ambiguous pictures would have allowed for more variances in cognitive distortion and less concern over obtaining correct answers. Secondly, the fact that the picture viewing task itself was relatively ambiguous, due to subjects not being required to respond to what they saw, was thought to have provided some room for individual differences to emerge. However, the task was presented within the context of a study skills experiment, which likely influenced subjects to study the picture as if they were going to be tested on what they had seen. Hence, subjects may have relied on a processing strategy to encode the information in the pictures rather than a more individualistic

approach whereby information was encoded according to personal bias and interest. Finally, viewing pictures in a laboratory setting may have limited cognitive distortions which may have occurred in a more natural setting.

An additional factor to consider is that although the use of several different food and body images scenes increased the generalizability over showing just one slide of each, the possibility of unknown confounds which were not able to be controlled for appears greater. Analyses yielded significantly larger mean scores for body image regions than food regions across all of the dependent variables, with the exception of fixation duration. Body image regions occupied a significantly larger portion of the slides and received higher information ratings than food regions, either of which could have influenced eye fixations. Transformation of the data into information density units still resulted in significant differences between the type of slide shown. Although analyses by slide were not performed, it is conceivable that significant differences across slides within each content area (i.e. food or body image) might also have been found.

Reasons for the findings that body image regions attracted more fixations while food items were fixated more quickly and for a longer period of time are difficult to discern. In addition, it is unclear what effect on cognitive sets and biases the questionnaires, fasting requirement, milkshake preload and experimental instructions may have had during the time course of picture viewing of the restrained and

nonrestrained subjects in this study. Numerous unknown factors between the slides shown may have operated during picture viewing to weaken between subject differences. This highlights the difficulty in finding stimuli that are ecologically valid and equivalent across many factors which influence picture viewing.

Summary of Considerations for Future Research

The present study presents a number of implications for future work attempting to identify cognitive correlates of dietary restraint. The question of how homogeneous a group are Restrainers has yet to be sufficiently answered. Measures in addition to restraint and weight scales could be used in future studies to distinguish further restraint subgroups. Internal-external locus of control, mood states, as well as questions specifically aimed at determining chronicity of dieting patterns, degree of food preoccupation and concern with weight may clarify more general restraint characteristics.

Another area which warrants further investigation is the manipulation of the hunger state. Future experimental designs may wish to consider comparing groupings of subjects according to acknowledged level of hunger as well as actual time spent fasting. In addition, more needs to be known about the use of ambiguous versus nonambiguous food stimuli and differential effects on the responses of Fasting and Nonfasting subjects.

Finally, there may be numerous as yet unidentified factors which can influence individual differences during the time course of picture viewing. Continued research into how particular stimuli, task demands

and instructions affect subjects' cognitive sets during picture viewing may add greater confidence that differences in attention observed between groups are due to the cognitive variable of interest.

Summary

In conclusion, this study of eye movement patterns among female undergraduates did not successfully demonstrate greater salience of food cues for dietary Restrainers and Fasting Nonrestrainers. Nor were restrainers found to prefer viewing female body shapes over nondieters. However, other differences between Restrainers and Nonrestrainers and between Fasting and Nonfasting subjects were observed but not completely explained by existing theory. Higher anxiety levels in restrained subjects may point to a significant state or trait difference between restrainers and nonrestrainers. Higher weights among restrainers may be an inherent confound in this population of subjects who are actively dieting. The implications of inclusion of overweight Restrainers deserves further exploration.

The data from this study failed to unequivocally support basic assumptions of the Boundary Model. Results appeared more supportive of Rodin's (1981) argument that externality among dieters, if it exists at all, may be limited to actual eating behavior. Nonsignificant results may have occurred due to subgroup differences in perceptions of hunger cues and resulting behaviors. Some ardent dieters may have exhibited a strong preoccupation with food and body shapes while others actively defended against thoughts of food to facilitate dieting behavior. Thus further research is recommended to

study the questions raised regarding the meaningfulness and utility of comparing dieters with nondieters as measured by the Revised Restraint Scale on cognitions and behaviors which extend beyond the counterregulation laboratory paradigm.

APPENDICES

APPENDIX A

SCREENING CONSENT FORM

The following is a short questionnaire that will be used as part of an eye movement experiment examining dietary habits and their effects on study skills. It will take about 5 minutes to complete for which you will earn extra credit. Completing these questions will also make you eligible to earn extra credit if you participate in another part of the study involving the measurement of eye movements.

All information received is held in strict confidentiality since only a number will appear with questionnaire data, not your name. At the end of the study these questionnaires will be disposed of.

You are not required to participate and may decline at any time. If you have any questions you amy contact the experimenter, Sally Brinza, by calling 777-3451. You will be given a copy of this form if you request one.

I have read the above and willingly agree to participate in this study.

_____

Signature of the Subject Date Phone Number

APPENDIX B

REVISED RESTRAINT SCALE

Please circle on this sheet the response which best describes you for each question.

1. How often are you dieting?
   a. Never b. Rarely c. Sometimes d. Usually e. Always

2. What is the maximum amount of weight you have ever lost within one month?
   a. 0-4 lbs b. 5-9 lbs c. 10-14 lbs
   d. 15-19 lbs e. 20 or more

3. What is your maximum weight gain within a week?
   a. 0-1 lbs b. 1.1-2 lbs c. 2.1-3 lbs
   d. 3.1-5 lbs e. more than 5

4. In a typical week, how much does your weight fluctuate (max. to min.)?
   a. 0-4 lbs b. 5-9 lbs c. 10-14 lbs
   d. 15-19 lbs e. 20 or more

5. Would a weight fluctuation of 5 lbs. affect the way you live your life?
   a. Not at all b. Slightly c. Moderately d. Very Much

6. Do you eat sensibly in front of others and splurge when alone?
   a. Never b. Rarely c. Often d. Always

7. Do you give too much time and thought to food?
   a. Never b. Rarely c. Often d. Always

8. Do you have feelings of guilt after overeating?
   a. Never b. Rarely c. Often d. Always

9. How conscious are you of what you're eating?
   a. Not at all b. Slightly c. Moderately d. Extremely

10. How many pounds over your desired weight were you at your maximum?
    a. 0 lbs b. 1-5 lbs c. 6-10 lbs
    d. 11-12 lbs e. more than 21 lb

11. Do you have feelings of guilt after overeating?
    a. Never b. Rarely c. Often d. Always

12. How conscious are you of what you're eating?
    a. Not at all b. Slightly c. Moderately d. Extremely

13. How many pounds over your desired weight were you at your maximum?
    a. 0 lbs b. 1-5 lbs c. 6-10 lbs
    d. 11-12 lbs e. more than 21 lbs

APPENDIX C

SCREENING QUESTIONS

Please answer the following questions:

What sex are you?_____ What is your age?_____

What is your height?_____ What is your weight?_____

Are you pregnant?_____ Are you a diabetic?_____

Do you have near 20/20 vision without the aid of glasses or contacts?_____

Do you wear soft contact lens?_____

Do you wear hard contact lens?_____

Do you regularily take any kind of stimulant or depressant drugs?_____

APPENDIX D

EXPERIMENT CONSENT FORM

You are invited to participate in a study which will examine the relationship between attention and study skills. You may be asked to drink a milkshake to control for hunger effects on attention. A short questionnaire will be given for you to complete in order to assess your current mood state which may also affect attention. Then you will be asked to look at several slides showing pictures, maps, and paragraphs of written words. Measurements of your eye movements will be taken while you are viewing the slides. You must have normal vision without the aid of glasses or hard contact lens for the eye movement equipment to function properly. Please inform the experimenter if you are wearing contact lenses. Participation in this study will take approximately 45 minutes. There are no physical or psychological risks or harm anticipated for participants. You are free to withdraw from this study at any time. All data obtained in this study is confidential and will be used only for the purpose of statistical analysis. The data will be reported as group averages only; indivdual data will not be reported. If you have any questions about this study you can call Sally Brinza at 777-3451. A meeting will be held Monday, May first at 7:00 P.M. to go over the study in more detail if you are interested. Keep this form, it is the only notice of this meeting you will receive.

I have read all of the above and I willingly agree to participate in this study.

_____

Signature Date

APPENDIX E

PHYSICAL STATUS QUESTIONNAIRE

What time was it when you last ate?_____

Please list the foods and drinks you had then and approximate amounts.

Food	Amount
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

What time do you usually eat supper (dinner)? _____P.M.

Please rate your current feelings of hunger or desire to eat.

a. very satisfied; no desire to eat
b. somewhat satisfied; minimal desire to eat
c. somewhat hungry; moderate desire to eat
d. very hungry; strong desire to eat

Please rate your level of alertness at this time,

a. highly alert
b. moderately high alertness
c. average alertness
d. low alertness
e. very low alertness

Please indicate if you have done any exercising today and if so, what type and for how long?

_____ yes type_____ amount of time_____

_____ no

How much sleep did you get last night? _____hours

How much time do you usually spend studying at these times?

Time of Day	Hours
Morning	_____
Afternoon	_____
Evening	_____

APPENDIX F

A-STATE SCALE

Directions: A number of statements which people have used to describe themselves are given below. Read each statement and then blacken the appropriate circle to the right of the statement to indicate how you feel right now, that is at this moment. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

1 = Not At All 2 = Somewhat 3 = Moderately So 4 = Very Much So

1.	I feel calm.	1	2	3	4
2.	I feel secure	1	2	3	4
3.	I am tense	1	2	3	4
4.	I am regretful	1	2	3	4
5.	I feel at ease	1	2	3	4
6.	I feel upset	1	2	3	4
7.	I am presently worrying over possible misfortunes	1	2	3	4
8.	I feel rested	1	2	3	4
9.	I feel anxious	1	2	3	4
10.	I feel comfortable	1	2	3	4
11.	I feel self-confident.	1	2	3	4
12.	I feel nervous	1	2	3	4
13.	I am jittery	1	2	3	4
14.	I feel "high strung".	1	2	3	4
15.	I am relaxed	1	2	3	4
16.	I feel content	1	2	3	4
17.	I am worried	1	2	3	4
18.	I feel over-excited and rattled	1	2	3	4

1 = Not At All 2 = Somewhat 3 = Moderately So 4 = Very Much So

19. I feel joyful 1 2 3 4

20. I feel pleasant 1 2 3 4

APPENDIX G

CHOCOLATE MILKSHAKE RECIPE

1 cup 2% milk
1 cup vanilla ice-cream
2 tablespoons chocolate syrup

Blend in blender until smooth.
Makes one 18 ounce milkshake with 474 kilocalories.

APPENDIX H
PICTURES AND CALIBRATION SLIDE

Figure 1.
Food Slide #1: Dining Room Scene (*Indicates Food Item)

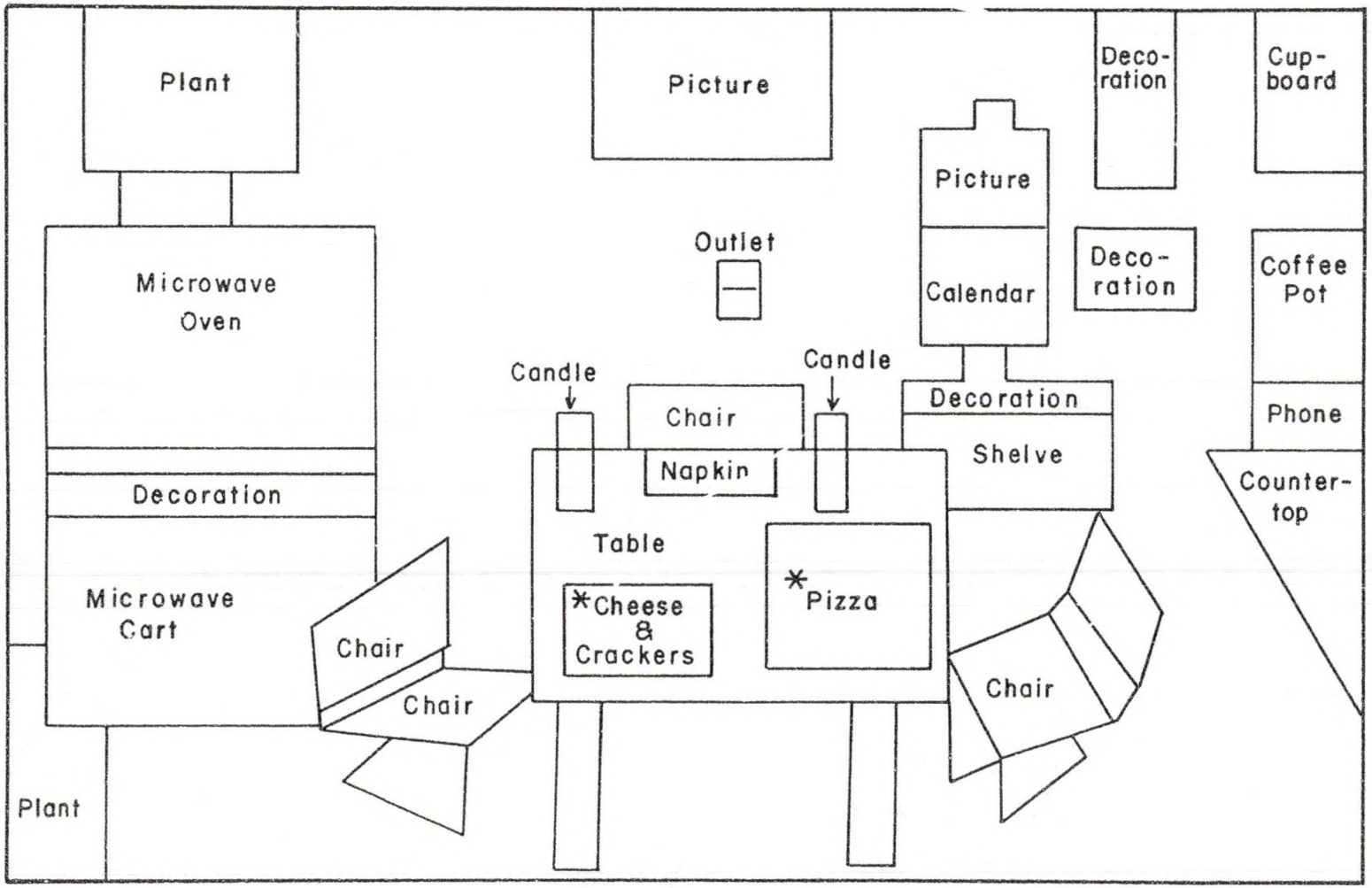


Figure 2.

Body Image Slide #1: Weight Room Scene (*Indicates Female Body)

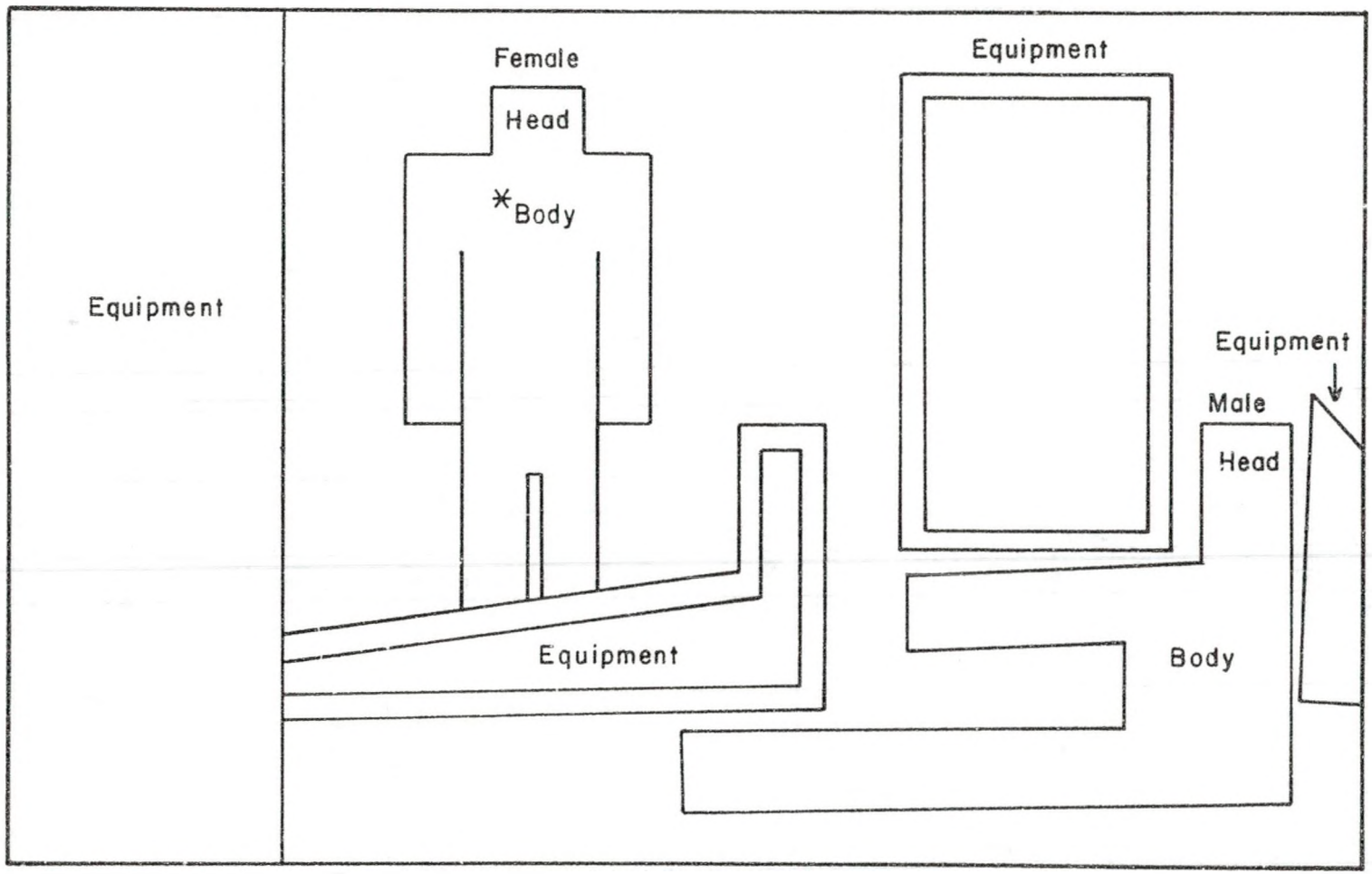


Figure 3.

Food Slide #2: Office With Computer Equipment Scene (*Indicates Food Item)

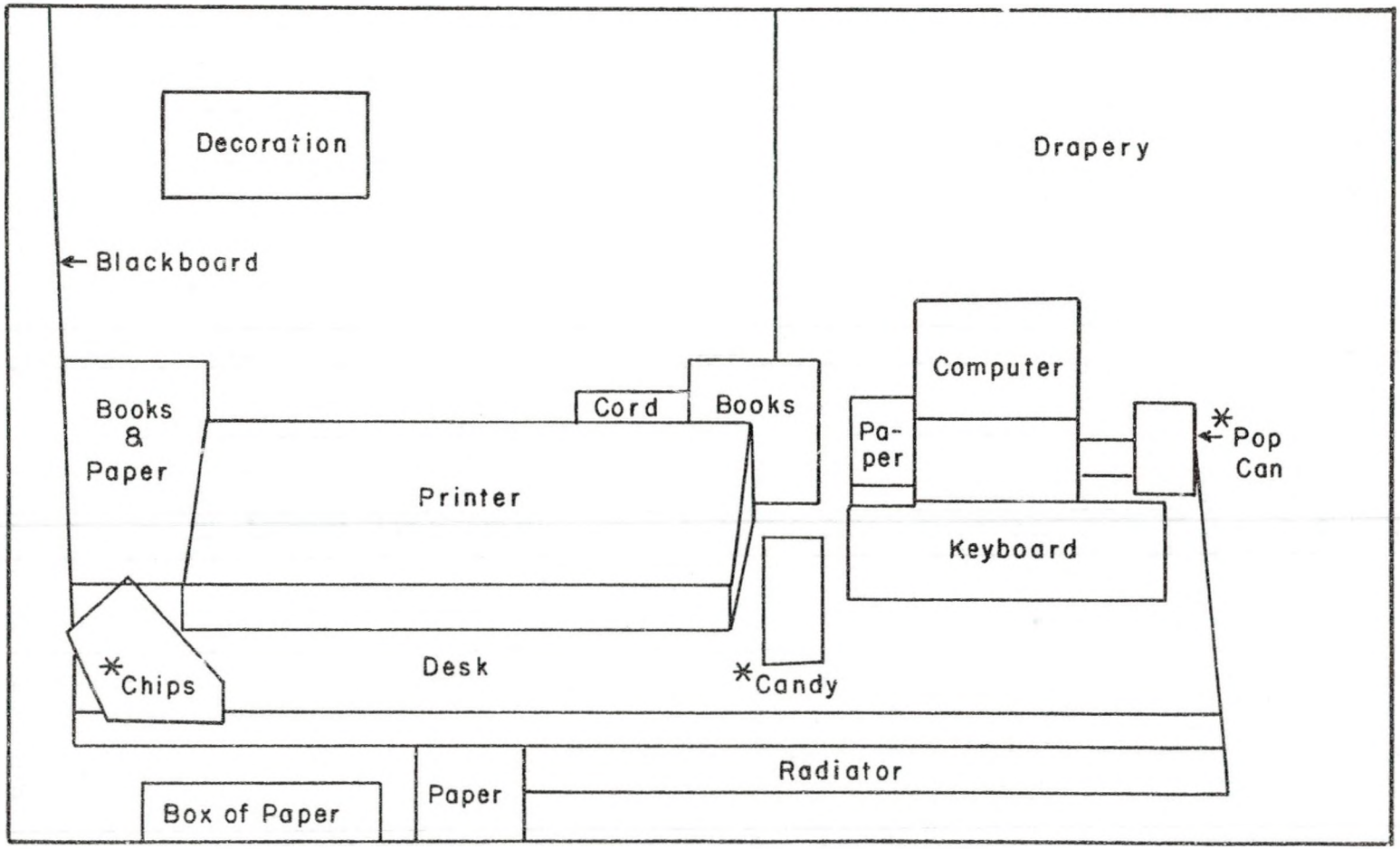


Figure 4.

Body Image Slide #2: Dorm Room Scene (*Indicates Female Body)

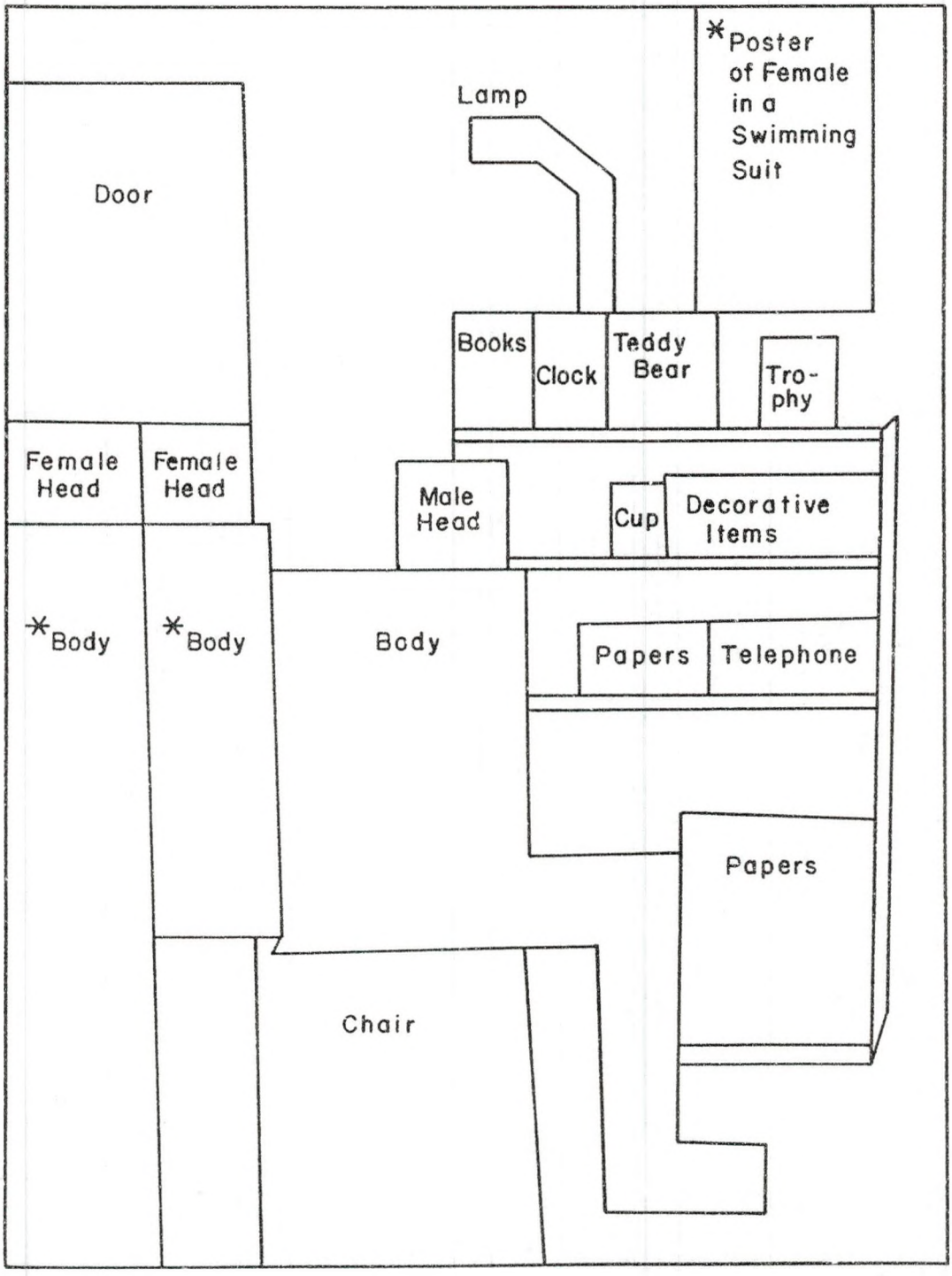


Figure 5.
Food Slide #3: Living Room Scene (* Indicates Food Item)

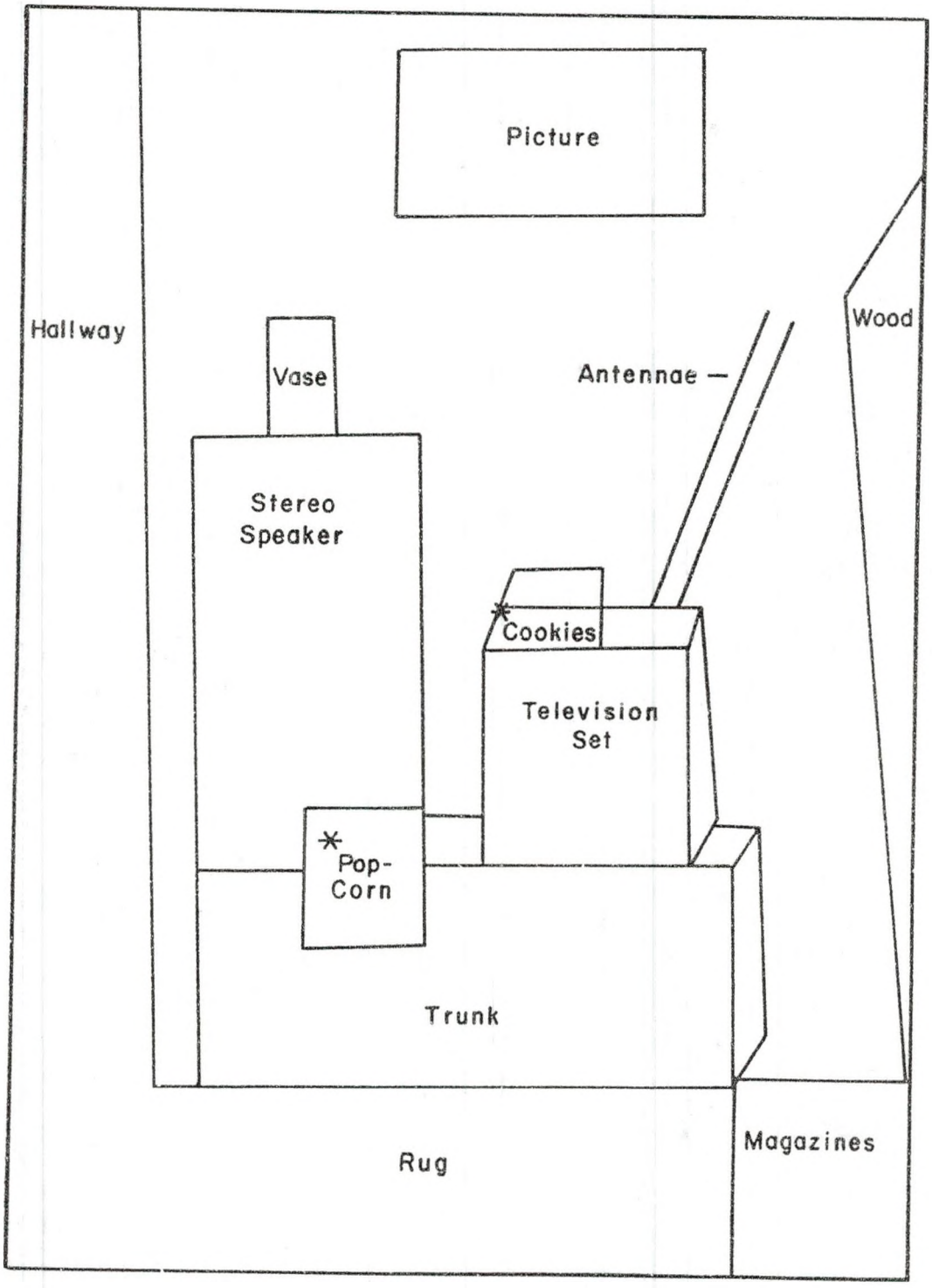


Figure 6.

Body Image Slide #3: Computer Room Scene (*Indicates Female Body)

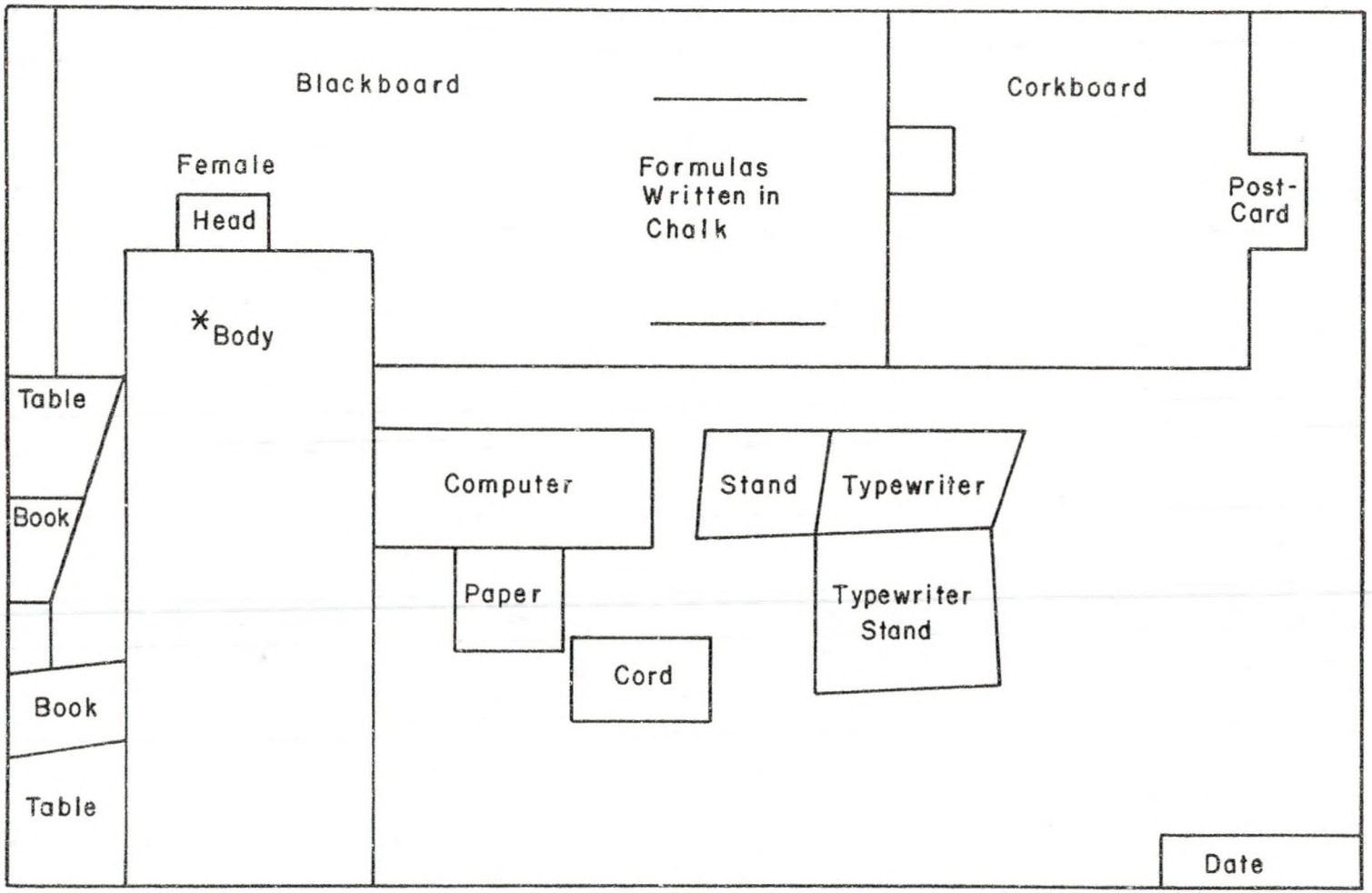
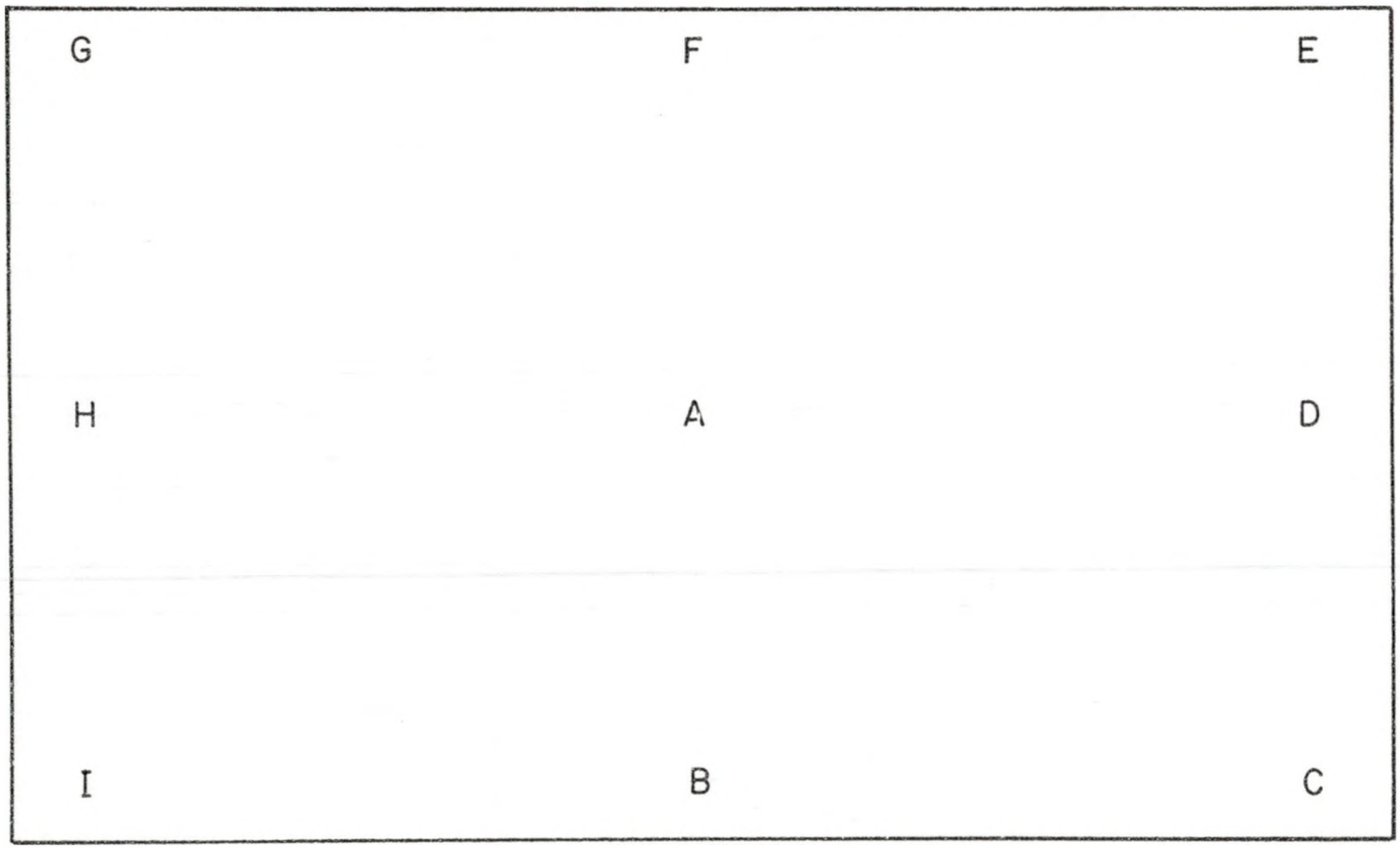


Figure 7.
Calibration Slide



APPENDIX I

Table 27

Metropolitan Insurance Company Weight Table for Women

Height Feet	Height Inches	Small Frame	Medium Frame	Large Frame
4	10	102-111	109-121	118-131
4	11	103-113	111-123	120-134
5	0	104-115	113-126	122-137
5	1	106-118	115-129	125-140
5	2	108-118	118-132	128-143
5	3	111-124	121-135	131-147
5	4	114-127	124-138	134-151
5	5	117-130	127-141	137-155
5	6	120-133	130-144	140-159
5	7	123-136	133-147	143-163
5	8	126-139	136-150	146-167
5	9	129-142	139-153	149-170
5	10	132-145	142-156	152-173
5	11	135-148	145-159	155-176
6	0	138-151	148-162	158-179

APPENDIX J

CONSENT FORM

This experiment will involve viewing six slides with pictures on them. You will rate various items in them according to how much information they contribute to the overall picture. There are no risks associated with participating in this study. You will receive extra credit (generally 1 point) for participating. You will not be required to put your name on the rating sheet, therefore all information obtained is completely confidential. You are free to withdraw from participating in this study at any time.

I have read the above statement and agree to participate in this study:

_____ _____

Name Date

APPENDIX K

INFORMATIVENESS RATING FORM

Slide #1

Background	_____
Gym equipment	_____ %
Peoples' heads	_____ %
Womans' body/clothing	_____ %
Mans' body/clothing	_____ %
Total	100%

Slide #2

Background	_____ %
Pictures/wallhangings	_____ %
Furniture	_____ %
Food	_____ %
Decorative items	_____ %
Appliances/electronics	_____ %
Total	100%

Slide #3

Background	_____ %
Poster	_____ %
Furniture	_____ %
Books/paper	_____ %
Appliances/electronics	_____ %
Peoples' heads	_____ %
Womans' body/clothing	_____ %
Mans' body/clothing	_____ %
Decorative items	_____ %
Total	100%

Slide #4

Background	_____ %
Pictures/wallhangings	_____ %
Furniture	_____ %
Food	_____ %
Books/paper	_____ %
Appliances/electronics	_____ %
Total	100%

Slide 5

Background	_____ %
Blackboard/corkboard	_____ %
Furniture	_____ %
Appliances/electronics	_____ %
Books/paper	_____ %
Peoples' heads	_____ %
Womans' body/clothing	_____ %
Total	100%

Slide 6

Background	_____ %
Pictures/wallhangings	_____ %
Furniture	_____ %
Food	_____ %
Magazines	_____ %
Decorative items	_____ %
Appliances/electronics	_____ %
Total	100%

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